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ABSTRACT

As part of a comprehensive, interdisciplinary environmental education program for elementary and secondary education in Hawaii, this teaching guide provides a variety of energy education activities for secondary social studies. An extensive introduction outlines the total program and how it fits into the general education program. It explains how to use the teaching guide which is organized around 15 core themes: energy fundamentals, evolution of energy, energy today, conservation, human dimensions, alternatives, storage and transmission systems, environmental and ecological considerations, cost, energy versus population versus food, interdependence, self-sufficiency, appropriate technology, and future perspectives. Background information is provided for each theme with related objectives and concepts. In addition, a list of activities and vocabulary is given. Some of the suggested activities are presented in an elaborate form indicating subject, grade, themes, objectives, concepts, competencies, other related objectives, materials, and activity with follow-up procedures. A bibliography concludes the manual. (DC)

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Environmental Education Supplementary Instructional Guide,

ENERGY USE AND THE ENVIRONMENT

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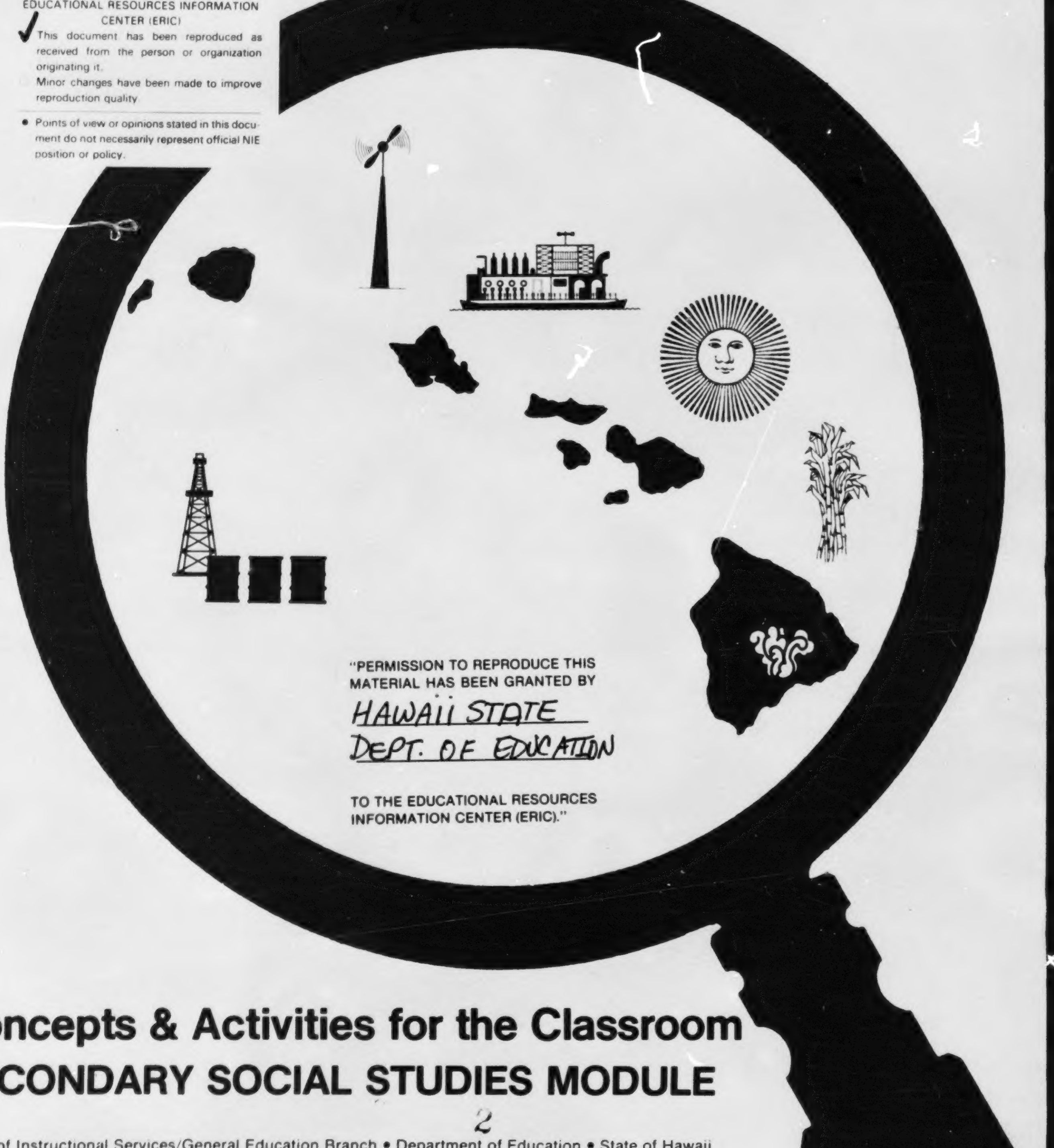

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Concepts & Activities for the Classroom
SECONDARY SOCIAL STUDIES MODULE

Office of Instructional Services/General Education Branch • Department of Education • State of Hawaii
RS 80-9341 • June 1980

SE 037 047

The Honorable George R. Ariyoshi
Governor, State of Hawaii

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FOREWORD

Many of the problems and issues we presently face reflect our increasing demand for energy with very little or no concern for our natural surroundings. The seriousness of today's energy situation can be viewed in terms of economic and environmental consequences as well as personal inconveniences. As a result, state, national and world attention is increasingly being focused on our need for, and wise use of, energy resources and our concern for the environment.

To cope with the reality of this world-wide energy problem, energy education must be provided for all citizens. The purpose of this kind of education is to develop an "energy literate" population that is informed about critical energy and environmental issues, can cope with change and make effective decisions in its futures-planning.

The issues related to energy use and the environment are becoming more complex because they are multi-dimensional and frequently global in nature. Adding to the complexity of these issues is the growth of technical knowledge and rapidly changing political and social conditions.

If students are to adequately understand and deal with these complex and often controversial issues, they must learn to view the issues from the perspectives of the citizen, consumer, worker, and producer as well as from the scientific, economic, social, ecological, cultural, technological, legal, and political frames of reference. Students need to be encouraged to become personally involved in issues and be provided with opportunities to project energy demands and environmental concerns into a futures perspective.

The Department of Education's energy education program focuses on providing learning experiences which will enable students to thoughtfully consider various alternatives, make decisions and take responsible actions in regard to energy use and the environment. These experiences will help them to become better decision makers and problem solvers in the future.

Charles G. Clark
Superintendent

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The *Energy Use and the Environment Secondary Social Studies Module* is the result of the cooperative efforts of many individuals and organizations. The energy education committee which drafted the initial framework and working document, Energy Education Center Staff which researched and wrote the module, teacher trainers who conducted workshops on the use of the module, and various organizations contributed toward the development of this module.

Many activities in this module were adapted for Hawaii from the following documents: *Social Education*, Official Journal of the National Council for the Social Studies, Vol. 44, No. 4, April, 1980; *Energy Activities, Grades 7-12*, North Carolina Department of Public Instruction, Raleigh, North Carolina, 1979; and *Hawaii's Economy*, Curriculum Resource Guide (Draft), Office of Instructional Services, Department of Education, Honolulu, Hawaii, 1972.

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TABLE OF CONTENTS

Secondary Social Studies Module

Page

FOREWORD i
ACKNOWLEDGMENTS ii
TABLE OF CONTENTS iv
INTRODUCTION 1
OVERVIEW 5
  GOAL 5
  OBJECTIVES AND CORE THEMES 6
  KEY ELEMENTS OF THE ENERGY EDUCATION PROGRAM 7
  K-12 ENERGY EDUCATION PROGRAM DESCRIPTION 8
  ORGANIZATION OF INSTRUCTIONAL MODULES 10
  GUIDELINES FOR USING THE MODULES 14
  ESSENTIAL COMPETENCIES 18
  SYMBOL KEY FOR SUBJECT AREAS, THEMATIC AREAS AND CORE THEMES . . 19

THEME 1. ENERGY FUNDAMENTALS 21
  THINGS TO DO 23
  SAMPLE ACTIVITY 1-1. "A Walk With Energy". 25

THEME 2. EVOLUTION OF ENERGY 29
  THINGS TO DO 31
  SAMPLE ACTIVITY 2-1. "From Kapus to Car Pools" 35
  SAMPLE ACTIVITY 2-2. "Petrol-genesis". 41
  SAMPLE ACTIVITY 2-3. "The Work Shift". 45
  SAMPLE ACTIVITY 2-4. "In Search of Power". 53
  SAMPLE ACTIVITY 2-5. "Play It Again Sam" 56

THEME 3. ENERGY TODAY 63
  THINGS TO DO 65
  SAMPLE ACTIVITY 3-1. "Fueling Around". 68
  SAMPLE ACTIVITY 3-2. "OPEC: Our Present Energy Condition" . . . 74
  SAMPLE ACTIVITY 3-3. "A Matter of Concern" 79

Page

THEME 4. CONSERVATION 83
THINGS TO DO 87
SAMPLE ACTIVITY 4-1. "Pond Broker". 90
SAMPLE ACTIVITY 4-2. "Pay As You Go". 97

THEME 5. HUMAN DIMENSIONS OF ENERGY 103
THINGS TO DO 107
SAMPLE ACTIVITY 5-1. "You Owe It To You". 110
SAMPLE ACTIVITY 5-2. "A Matter of Choice" 115

THEME 6. ENERGY ALTERNATIVES 121
THINGS TO DO 125
SAMPLE ACTIVITY 6-1. "Watt's The Alternative?". 127

THEME 7. ENERGY STORAGE AND TRANSMISSION SYSTEMS. 133
THINGS TO DO 135

THEME 8. TRANSPORTATION 137
THINGS TO DO 141
SAMPLE ACTIVITY 8-1. "Our Motorized Mistress" 144

THEME 9. ENVIRONMENTAL/ECOLOGICAL CONSIDERATION 155
THINGS TO DO 159
SAMPLE ACTIVITY 9-1. "Breaking The Cycle" 163
SAMPLE ACTIVITY 9-2. "Land Use and Abuse" 169
SAMPLE ACTIVITY 9-3. "Landscrape: The Price of Progress?". . . 173

THEME 10. ENERGY COST, RESPONSIBILITY AND PRIVILEGE 185
THINGS TO DO : 189
SAMPLE ACTIVITY 10-1. "Reaping What We Sow" 193
SAMPLE ACTIVITY 10-2. "A Balancing Act" 198
SAMPLE ACTIVITY 10-3. "A Promotion For Energy". 205
SAMPLE ACTIVITY 10-4. "What Price Energy? 210

THEME 11. ENERGY VS. POPULATION VS. FOOD 215
THINGS TO DO 217
SAMPLE ACTIVITY 11-1. "More Means Less" 220

8

Page

THEME 12. ENERGY INTERDEPENDENCE 225

THINGS TO DO 227

SAMPLE ACTIVITY 12-1. "Dealer's Choice?". 229

THEME 13. ENERGY SELF-SUFFICIENCY. 233

THINGS TO DO 235

SAMPLE ACTIVITY 13-1. "Living Within One's Means" 237

THEME 14. APPROPRIATE ENERGY TECHNOLOGY 243

THINGS TO DO 247

THEME 15. FUTURE PERSPECTIVE 249

THINGS TO DO 253

BIBLIOGRAPHY. 255

INTRODUCTION

The growth of technology and the ever changing political and social conditions make it necessary for students to achieve energy literacy. Students need to be able to cope with and understand energy-related issues and problems as these relate to their own personal environment and their global environment.

> "Since education is the principal agency charged with the task of equipping the individual for a lifetime of effective living and learning, it must provide a program which will allow him/her to deal effectively with the world that is already upon him/her, as well as a yet-unknown world which is certain to converge on him/her with dramatic suddenness. Thus, planning for the future becomes urgent if we are to understand future requirements and cope with them in an orderly and efficient manner."[1]

The educational purposes as stated in the Master Plan for Public Education in Hawaii indicate the ends to which our educational system should direct its efforts. The purposes of the Department of Education are to provide students with equal opportunities for a basic education and to prepare them for the life-long process of self-education.

> "The Foundation Program is a plan to fulfill the commitment for equal opportunities in education as stated in the Master Plan for Public Education in Hawaii. It offers students the school programs through which they can acquire the fundamental skills of computation, language, the arts, the physical and social sciences. The Foundation Program also provides students with the opportunities to use and practice these skills to communicate and acquire knowledge; to pursue knowledge independently and apply that knowledge in making decisions; to grow in personal/social development; to develop and maintain good health; and to be able to choose from a variety of career opportunities.
>
> There are eight Foundation Program objectives. These statements of objectives indicate the kinds of behavior we hope to see students demonstrate as they grow into adulthood. The list of objectives covers those related behaviors that describe students as active, contributing human beings in our society."[2]

---

[1] Master Plan for Public Education in Hawaii, Department of Education, September, 1969.

[2] Foundation Program for the Public Schools in Hawaii, Department of Education, April, 1974.

The eight Foundation Program objectives are:[3]

1. Develop basic skills for learning and effective communication with others.
2. Develop positive self-concept.
3. Develop decision-making and problem-solving skills at the student's proficiency level.
4. Develop independence in learning.
5. Develop physical, social and emotional health.
6. Recognize and pursue career development as an integral part of growth and development.
7. Develop a continually growing philosophy such that the student is responsible to self as well as to others.
8. Develop creative potential and aesthetic sensitivity.

A major aim of the Department of Education's Environmental Education Program is to promote the educational purposes as stated in the Master Plan for Public Education in Hawaii and the objectives of the Foundation Program for the Public Schools in Hawaii. To accomplish this intent, the design for the Environmental Education K-12 Curriculum Guide uses statements of performance expectations, including essential competencies, program goal and objectives as translations of the educational purposes and objectives mentioned above.

The goal of the Environmental Education Program in Hawaii's schools is to develop an environmentally literate and enlightened society which, through its ethical commitment to wise use of its resources, creates and maintains optimum quality in both human-made and natural environments. Achievement of this goal will be indicated by attainment of the following objectives whereby students:[4]

1. Develop awareness of themselves in relation to their environment and the need for wise use of the environment.
2. Develop knowledge of the various aspects of the environment--land, water, sea, air, total eco-systems--and the inter-relatedness among human lives, environmental concerns and social, political, cultural and economic structures.
3. Develop skills in coping with environmental problems.
4. Develop attitudes and values which will help them to live in harmony with the environment.

---

[3] The Foundation Program's Authorized Courses and Code Numbers 1980-81, Department of Education.

[4] Environmental Education K-12 Curriculum Guide, Department of Education, December, 1978.

11

The major instructional goals of the six areas in the Environmental Education Curriculum Guide are given in the following list.[5]

1. Energy Use and Development: Students will support and practice wise utilization of traditional sources of energy and also support research and development of alternate energy sources.
2. Use of Earth Resources: When faced with decisions concerning the use of earth resources, students will select practices developed in recognition of present and future environmental and human needs.
3. Resource Reclamation: Students will voluntarily participate in programs involving resource reclamation.
4. Population Processes and Dynamics: Students will demonstrate their awareness of population processes and dynamics.
5. Interdependence of Living Things: Students will demonstrate an appreciation for the interdependence of living things in the closed earth system.
6. Improving the Quality of Life: Students will examine optional courses of action and their consequences for improving the quality of life and will support those that will provide optimum short- and long-term benefits for society and the environment.

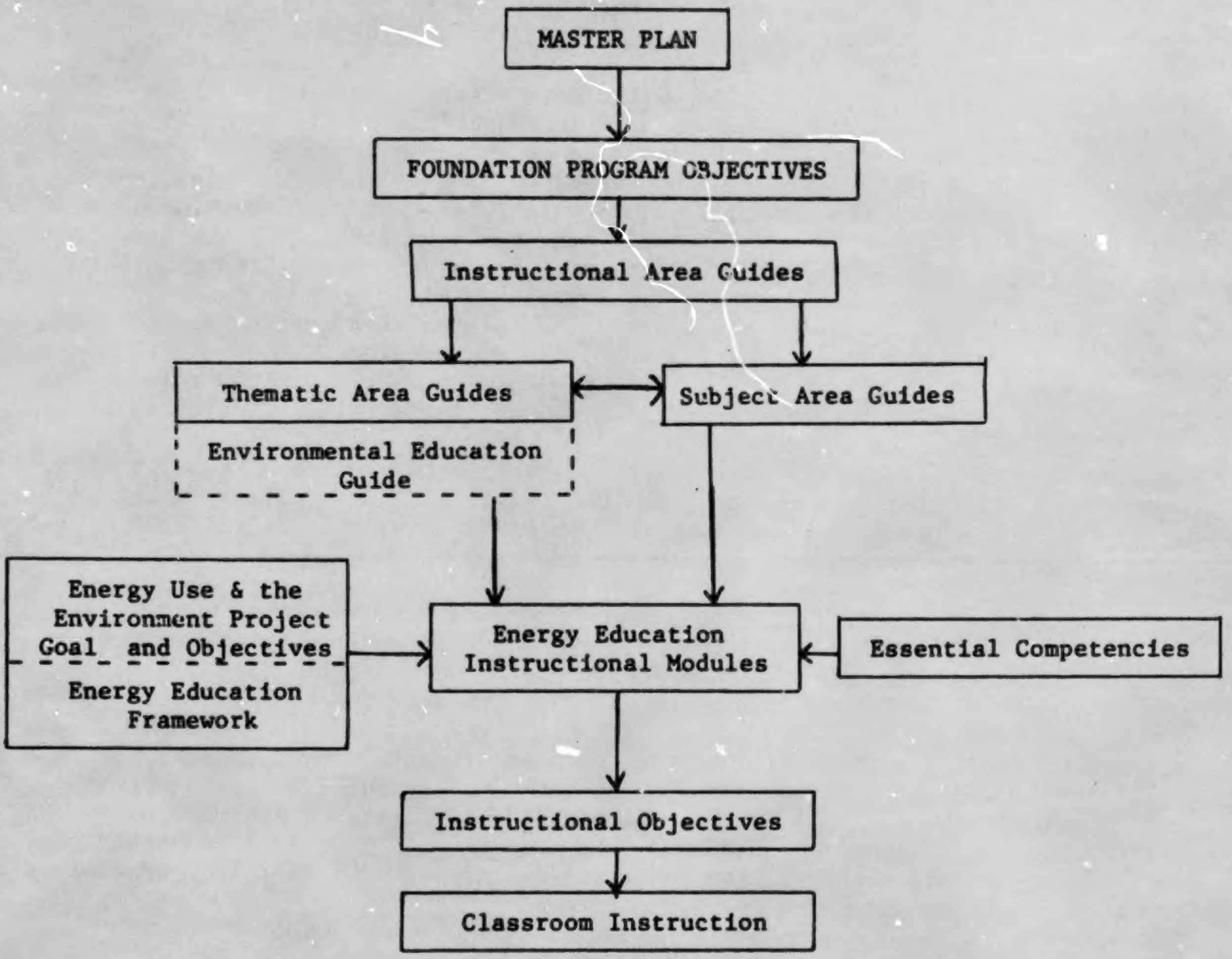
Energy is the focus of one area and is pervasive throughout the other five areas. It should also be noted that all areas are interrelated. Therefore, an energy education program has been developed as an integral part of environmental education and incorporates all of these areas.

In keeping with the environmental education format, energy education involves all instructional areas either through an interdisciplinary and/or multi-disciplinary approach. The relationship of classroom instruction in Energy Education to the Master Plan, Foundation Program, the Environmental Education Guide and the remaining instructional area guides and the essential competencies is shown in the following diagram:*

---

[5] Ibid

*The present instructional area guides consist of subject area guides in 1) Agriculture, 2) Art, 3) Asian, European and Pacific Languages, 4) Basic Practical Arts, 5) Business Education, 6) Health, 7) Home Economics, 8) Industrial Arts, 9) Industrial -Technical Education, 10) Language Arts, 11) Mathematics, 12) Music, 13) Physical Education, 14) Science, and 15) Social Studies and thematic area guides in 1) Career Education, 2) Environmental Education, 3) Guidance, 4) Library Skills, 5) Student Activities and 6) Values Education.


MASTER PLAN
FOUNDATION PROGRAM OBJECTIVES
Instructional Area Guides
Thematic Area Guides
Subject Area Guides
Environmental Education Guide
Energy Use & the Environment Project Goal and Objectives
Energy Education Framework
Energy Education Instructional Modules
Essential Competencies
Instructional Objectives
Classroom Instruction

RELATIONSHIP AMONG MASTER PLAN, FOUNDATION PROGRAM OBJECTIVES, ENVIRONMENTAL EDUCATION, SUBJECT AND THEMATIC AREAS, ESSENTIAL COMPETENCIES, AND CLASSROOM INSTRUCTION IN ENERGY EDUCATION.

By viewing the energy education program in this manner and understanding its rationale and development, teachers will realize that energy education is not a new subject. They can then review present lessons to determine what is already being done in terms of energy education and use the modules as integrative tools in their day-to-day interactions with students. In this context, the energy education modules will become meaningful, helpful and truly functional to teachers and their students.

OVERVIEW

Society has grown materially and technologically, but has not controlled many of the negative by-products of this growth. The demand for higher standards of living with little or no concern for the resulting energy and environmental problems heightens the importance of educating our young people in this area of growing concern. Thus, energy education must become part of the broader effort needed to make citizens aware of the issues and problems related to energy use and the environment.

GOAL

The goal of energy education is to develop an "energy literate" population with the necessary intellectual resources, values, attitudes, and decision-making skills to cope with problems and issues associated with energy use and the environment. The following list of traits may be used to define an energy literate person.

An energy literate person:

1. Uses energy conservation and wise-use concepts, practices, and values in making everyday decisions as he/she interacts with other people and his/her environment.
2. Understands that the generation of energy-related knowledge depends upon the inquiry process and upon conceptual theories.
3. Distinguishes between scientific evidence and personal opinion regarding energy-related matters.
4. Identifies the relationships among energy-related facts, concepts and theories.
5. Recognizes the limitations as well as the usefulness of scientific and technological research in the development of energy for improving the quality of life.
6. Has sufficient knowledge and experience so that he/she can appreciate energy-related work being carried out by others.
7. Understands the interrelatedness of science, technology and other facets of society, including social, economic, political and cultural systems, when considering issues and problems related to energy and the environment.
8. Recognizes the human origin of energy-related knowledge and understands that this knowledge is tentative and subject to change as evidence accumulates.
9. Has adopted values based on principles underlying wise and judicious use of energy and the environment.
10. Continues to inquire and increase his/her knowledge about energy and the environment throughout his/her life.
11. Uses problem-solving skills and takes appropriate actions in contributing to the solutions of energy-related problems.
12. Recognizes that energy-related decisions made today will affect his/her life and those of future generations.
13. Uses decision-making skills in assessing the outcomes of alternative actions and policies regarding preferred futures related to energy use and the environment.

OBJECTIVE AND CORE THEMES

To achieve the goal of developing an "energy literate" population, a general objective was formulated and articulated in the Energy Education Framework for each of fifteen core themes. The objectives were selected to reflect the scientific, technological, historical, social, political, economic, and human perspectives of energy issues and problems. The core themes were developed by integrating the energy-related concepts and the views from as many disciplines and interest areas within the community as possible. They are tangible, definable, relevant and "in toto" a reasonably complete representation of energy in Hawaii, yesterday, today and tomorrow.

The following is a list of core themes and general instructional objectives. Each objective is attained when the student demonstrates the general behavior defined for each theme.

1. Energy Fundamentals: Applies basic laws of science and mathematics to the study of energy.
2. Evolution of Energy: Understands the historical development of sources and uses of energy.
3. Energy Today: Knows current sources and uses of energy.
4. Conservation: Formulates and practices a conservation ethic in regard to energy use and the environment.
5. Human Dimensions of Energy: Understands that personal values and choices of energy use will affect the quality of life for all.
6. Energy Alternatives: Knows alternative energy sources and uses.
7. Energy Storage and Transmission Systems: Knows various energy storage and transmission systems.
8. Transportation: Knows a wide range of transportation modes and their energy resource requirements.
9. Environmental/Ecological Considerations: Knows various energy options and their environmental/ecological benefits and consequences.
10. Energy Cost, Responsibility and Privilege: Understands various energy cost/responsibility/privilege interrelationships.
11. Energy vs. Population vs. Food: Understands various energy/population/ food interrelationships.
12. Energy Interdependence: Understands current energy exchange practices which link nations in an economically, socially and politically interdependent manner.
13. Energy Self-Sufficiency: Understands the movement towards self-sufficiency as necessary and feasible.
14. Appropriate Energy Technology: Understands that energy technology has to fit the use to which it is put with minimum negative effects upon the quality of life.
15. Future Perspective: Utilizes decision-making and problem-solving skills in formulating plans and actions to achieve a preferred future in energy use and the environment.

KEY ELEMENTS OF THE ENERGY EDUCATION PROGRAM

To achieve the goal and objectives of energy education, this program utilizes an interdisciplinary approach, relates to the everyday life of students, considers personal values and involvement, and focuses on the decisions that will have to be made for the future. It is designed to help students understand and appreciate the impact of energy use on their past, present and future environments. In addition, energy education may provide the stimulus for some students to discover untapped sources of energy, devise new ways to use "old" sources, and invent new machines which many contribute to the solutions of our complex energy problems.

The following elements are emphasized in this program:

1. An interdisciplinary and/or multidisciplinary approach to energy education is used whenever possible. The approach emphasizes the teaching of energy as necessarily involving many subject areas to adequately educate young people about the complexity and interrelatedness of the issues and problems associated with energy use and the environment.

   The use of information and concepts from many disciplines such as science, social studies, mathematics, and economics to explain and understand energy-related problems and issues reflects the interrelatedness among science, society, and technology. For example, the application of economic concepts enables students to examine the supply and demand for various energy resources. From a technological perspective, students are able to examine the costs and benefits of new scientific procedures used to produce, convert, store, transport, and utilize these energy resources. In addition, political science concepts are useful for assessing ways in which the political processes within and among nations determine the extent to which economic efficiency and technological possibilities influence the availability of energy resources for world consumption.

2. To make energy education relevant, energy problems and issues are related to the everyday life of students. This enables students to understand energy as an important component of their daily lives. Students are encouraged to become personally involved in energy-related issues by making decisions and taking problem-solving actions.

3. Another key element of energy education is students' attitudes and personal values in making decisions. When energy-related issues and problems are integrated into the total curriculum, students become aware of their personal values as they are involved in the process of choosing from alternatives after thoughtful consideration of the consequences of each alternative. They also realize that decisions are made in light of the values and goals of a given society as a whole and each person as a member of the society.

It is important for students to understand that resources are finite and to develop a "conservation ethic" and be positively affected in their attitudes toward appropriate choice and wise use of energy resources.

4. Energy education focuses the students' attention to the future. It allows them to examine the alternatives and possible outcomes of many possible futures. This program also emphasizes that decisions and actions for a preferred future should be based on values of society, technology, and issues and facts related to energy use and the environment.

   Students should realize that they must have an active say in what kind of future they want. They must also understand that decisions made today will affect both their own lives and those of generations to come.

   This orientation of energy education to the future will help students realize the importance of being flexible and adaptable. It will also enable them to better cope with rapidly changing technology and political, social and economic circumstances affecting energy use and the environment.

K-12 ENERGY EDUCATION PROGRAM DESCRIPTION

Energy education is not a new subject. A review of present curriculum guides can determine what is already being done in terms of energy education. The task of implementing energy education is primarily one of refocusing what is now being done, rather than trying to add another new subject.

The major components of the planned energy education effort of the Department of Education are designed to assist teachers in implementing energy education in the public schools of Hawaii. They include:

1. An assessment of present curriculum guides. The following chart indicates where core themes of the Energy Use and the Environment Project are directly or indirectly mentioned in the various instructional area guides.

ASSESSMENT OF K-12 CURRICULUM GUIDES
CORRELATION OF CORE THEMES
WITH INSTRUCTIONAL AREAS

LEGEND:

The position of the numbers represents grade levels.

- Upper left corner represents grades K-3
- Lower left corner represents grades 4-6
- Upper right corner represents grades 7-9
- Lower right corner represents grades 10-12

K-3	7-9
4-6	10- 12

The numbers on the chart represent the degree to which energy education is covered.

0 - No mention of energy education.
1 - Indirect mention of energy education.
2 - Direct mention of energy education.

INSTRUCTIONAL AREAS / CORE THEMES	ELEMENTARY/SECONDARY								ADDITIONAL SECONDARY						
	Art	Health	Language Arts	Mathematics	Music	Physical Education	Science	Social Studies	Agriculture	Asian, European and Pacific Languages	Basic Practical Arts	Business Education	Home Economics	Industrial Arts	Industrial-Technical Education
1. Energy Fundamentals	0 0 0 0	1 2 1 2	0 0 0 0	1 1 1 1	0 0 0 0	1 1 1 1	2 2 2 2	0 1 0 1	0 1	0 0	2 0	0 0	0 2	0 2	0 2
2. Evolution of Energy	1 1 1 1	0 0 0 0	1 1 1 1	0 0 0 0	1 1 1 1	0 0 0 0	2 2 2 2	2 2 2 2	0 1	1 1	1 0	0 1	0 1	0 1	0 1
3. Energy Today	1 1 1 1	1 1 1 1	1 1 1 1	0 1 0 1	1 1 1 1	0 1 1 1	2 2 2 2	2 2 2 2	0 1	1 1	2 0	0 2	0 1	0 1	0 1
4. Conservation	1 1 1 1	1 1 1 1	1 1 1 1	0 1 1 1	1 1 1 1	1 1 1 1	2 2 2 2	2 2 2 2	0 2	1 1	2 0	0 2	0 2	0 2	0 2
5. Human Dimensions of Energy	2 2 2 2	2 2 2 2	2 2 2 2	0 1 1 1	1 1 1 1	0 1 1 1	2 2 2 2	2 2 2 2	0 2	2 2	2 0	0 2	0 2	0 2	0 2
6. Energy Alternatives	1 1 1 1	0 0 0 0	0 1 1 1	0 1 1 1	0 0 0 0	0 0 0 0	2 2 2 2	1 2 1 2	0 1	1 1	2 0	0 1	0 2	0 2	0 2
7. Energy Storage and Transmission Systems	0 0 0 0	0 0 0 0	0 0 0 0	0 1 1 1	0 0 0 0	0 0 0 0	0 2 1 2	0 2 0 2	0 0	0 0	1 0	0 0	0 1	0 1	0 2
8. Transportation	1 1 1 1	1 1 1 1	1 1 1 1	0 1 1 1	0 0 0 0	0 0 0 0	1 2 1 2	1 2 1 2	0 2	2 2	1 0	0 2	0 1	0 2	0 2
9. Environmental/Ecological Considerations	2 2 2 2	2 2 2 2	2 2 2 2	0 1 0 1	1 1 1 1	1 1 1 1	2 2 2 2	2 2 2 2	0 2	1 1	2 0	0 2	0 2	0 2	0 2
10. Energy Cost, Responsibility and Privilege	0 0 0 0	0 0 0 0	1 1 1 1	1 1 1 1	0 0 0 0	1 1 1 1	1 2 1 2	1 2 2 2	0 1	0 0	2 0	0 2	0 2	0 2	0 2
11. Energy vs. Population vs. Food	0 0 0 0	1 1 1 1	1 1 1 1	0 1 1 1	0 0 0 0	0 0 0 0	2 2 2 2	2 2 2 2	0 2	2 2	2 0	0 2	0 2	0 0	0 0
12. Energy Interdependence	0 0 0 0	0 0 0 0	0 1 0 1	0 1 1 1	0 1 0 1	0 0 0 0	0 2 1 2	1 2 2 2	0 2	2 2	1 0	0 2	0 1	0 1	0 1
13. Energy Self-Sufficiency	0 0 0 0	0 0 0 0	0 1 0 1	0 1 1 1	0 0 0 0	0 0 0 0	0 2 1 2	0 2 1 2	0 1	1 1	1 0	0 2	0 1	0 1	0 1
14. Appropriate Energy Technology	1 1 1 1	0 0 0 0	1 1 1 1	0 1 1 1	0 0 0 0	0 0 0 0	2 2 2 2	1 2 1 2	0 2	1 1	2 0	0 1	0 2	0 2	0 2
15. Future Perspective	1 1 1 1	0 0 0 0	2 2 2 2	1 1 1 1	0 0 0 0	0 1 1 1	2 2 2 2	2 2 2 2	0 2	1 1	2 0	0 2	0 2	0 2	0 2

2. A resource handbook. This handbook is a compilation of background information, helpful hints about teaching strategies and content organization, practical ideas for classroom activities and suggested reference materials and resources available to teachers and students. It includes lists of reference books, curriculum materials, films, field trips, speakers, etc. The handbook is intended to be a practical reference guide.

3. Student assessment/evaluation instruments for each grade level in the elementary school (K-6) and for various subject areas at the secondary level. These instruments include pre- and post-tests to assess and evaluate the progress of students in their attainment of energy-related concepts.

4. Instructional modules for each grade level in the elementary school (K-6) and for various subject areas at the secondary level (Basic Practical Arts, Science, Social Studies, etc.). These modules are composed of suggested activities based on the fifteen core themes that form the framework for the Energy Use and the Environment Project. They were designed to emphasize and integrate energy-related concepts, issues, and problems within the existing instructional areas.

ORGANIZATION OF INSTRUCTIONAL MODULES

The modules are intended to give the teacher an orientation, background information and general suggestions for teaching activities related to energy use and the environment. Each module is organized by core themes. The foreword, introduction and overview sections are color coded in yellow. The "Background Information" pages for each theme are color coded in green throughout the module while the "Things To Do" and "Sample Activity" pages are white. The components of these pages are described on the format pages that follow.

"BACKGROUND INFORMATION" PAGE FORMAT

THEME (Number). TITLE

BACKGROUND

A brief description of the theme and its significance to energy education.

FOUNDATION PROGRAM OBJECTIVES

A list of the Foundation Program Objectives (FPO's) appropriate to the theme.

CORE THEME OBJECTIVE

A statement of the general instructional objective of the theme.

CONCEPTS

A list of important concepts of the theme. It represents some key perspectives and interests about energy but is not exhaustive.

RELATED GOALS AND/OR GENERAL OBJECTIVES OF SUBJECT AREA GUIDES

Taken from various subject area program guides, a list of goals and/or general objective statements related to the theme. (The page number listed refers to that of the guide from which the goal or objective was taken.)

DESCRIPTION OF COMPONENTS OF THE "BACKGROUND INFORMATION" PAGE FOR EACH CORE THEME.

The "Background Information" pages for the fifteen core themes are included in all of the modules, i.e., for all grade levels and subject areas. These pages appear in green throughout the modules.

"THINGS TO DO" PAGE FORMAT

THEME (Number). Title

Subject Area ____________

Grade Level ____________

THINGS TO DO

A list of suggested classroom activities that are appropriate to the theme. An activity marked with an asterisk (*) indicates that a detailed explanation is given on the "Sample Activity" pages that follow the list.

VOCABULARY

A list of suggested key words for the theme. The teacher should determine which words are appropriate for a particular class or group of students.

DESCRIPTION OF COMPONENTS OF THE "THINGS TO DO" PAGE FOR CORE THEMES EMPHASIZED IN A GIVEN GRADE LEVEL OR SUBJECT AREA.

Although only a few themes are emphasized in any given grade level or subject area, all of the themes are covered in the combined set of modules in the overall K-12 program. For each core theme that is emphasized, the module includes a "Things To Do" page. Note that the blank space for subject area in the upper right hand corner of this page will be used to list areas directly related to one or more of the activities listed under "Things To Do." These pages appear in white throughout the modules.

"SAMPLE ACTIVITY" PAGE FORMAT

THEME (Number). Title

Subject Area ___________
Thematic Area ___________
Grade Level ___________

SAMPLE ACTIVITY (Number). Title

OBJECTIVE

Statement of general objective of the core theme.

CONCEPTS

A list of selected core theme concepts appropriate to the sample activity.

ESSENTIAL COMPETENCIES

A list of essential competencies (EC's) appropriate to the activity.

RELATED ENVIRONMENTAL EDUCATION INSTRUCTIONAL GOALS AND/OR OBJECTIVES

A list of instructional goals and/or objectives from the Environmental Education K-12 Curriculum Guide which are appropriate to the activity.

INSTRUCTIONAL OBJECTIVES

A list of appropriate general and/or specific instructional objectives or performance expectations (PE's) taken from subject area curriculum guides.

SUGGESTED MATERIALS AND/OR RESOURCES

A list of suggested materials and/or resources appropriate to the activity.

ACTIVITY (Related Core Themes: __)

A detailed explanation of the activity which includes suggested procedures and relationships to other appropriate core themes.

SUGGESTED FOLLOW-UP/ASSESSMENT ACTIVITIES

A list of activities which may be helpful in assessing students and/or summarizing the sample classroom activity.

DESCRIPTION OF COMPONENTS OF THE "SAMPLE ACTIVITY" PAGE FOR SAMPLE CLASSROOM ACTIVITIES.

Some of the classroom activities listed on the "Things To Do" page are explained in detail on the "Sample Activity" page. Note that the blank space for subject area in the upper right hand corner of the "Sample Activity" page will be used to list areas directly related to the instructional objective of the activity and, in the parenthesis following, a list of other areas which involve skills and attitudes related to the activity. The thematic area blank space will list those thematic instructional areas that involve skills and/or attitudes relevant to the sample activity. The "Sample Activity" pages appear in white throughtout the modules.

GUIDELINES FOR USING THE MODULES

The following guidelines are offered to assist teachers in using the energy education modules. The modules are designed to provide students with experiences which stimulate creative social and scientific thinking, exploration, decision-making and problem-solving of energy-related issues.

1. The teacher is free to use the modules in any manner. It is the responsibility of each teacher to select the themes, objectives, concepts, and activities which reflect his/her instructional objectives and the needs of a particular class or group of students.

2. The time needed to complete a module varies from one to two or more weeks depending upon the number of activities selected. Whether the activities are used in total or in part will be determined by the age, ability level and interest of the students. Some activities lend themselves to periodic observations over a few months while others can be done in a few days.

3. Core themes appropriate to the ability levels of students and/or subject areas were selected for emphasis at each grade level in the elementary school and various subject areas at the secondary level. The following chart indicates the level of emphasis of each core theme in the various modules of the K-12 energy education program.

4. Worksheets and Exercises are written for the students; therefore are printed on white for easy reproduction. For the secondary level modules, the "Things To Do" pages are also written for the students and are also on white sheets.

LEVELS OF EMPHASIS OF CORE THEMES IN THE K-12 ENERGY EDUCATION PROGRAM

Emphasis
+ Heavy
✓ Some
- Little
0 None

Core Themes \ Grade Level and/or Subject Area	Elementary (K-6) (Grade Level)							Secondary (7-12) (Subject Area)														
	Kindergarten	First	Second	Third	Fourth	Fifth	Sixth	Agriculture	Art	Foreign Language	Basic Practical Arts	Business Education	Health	Home Economics	Industrial Arts	Vocational - Technical Education	Language Arts	Mathematics	Music	Physical Education	Science	Social Studies
1. Energy Fundamentals	-	-	-	✓	✓	✓	+	✓	-	0	✓	0	-	✓	+	+	0	✓	0	-	+	-
2. Evolution of Energy	-	-	-	✓	✓	+	✓	✓	✓	-	+	✓	0	+	✓	✓	✓	0	✓	0	✓	+
3. Energy Today	✓	✓	✓	✓	+	+	+	+	✓	✓	+	+	✓	+	+	+	✓	✓	✓	✓	+	+
4. Conservation	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
5. Human Dimensions of Energy	-	-	-	-	✓	✓	+	✓	✓	✓	✓	✓	+	+	✓	✓	+	✓	✓	✓	✓	+
6. Energy Alternatives	0	0	0	-	✓	✓	✓	-	✓	-	✓	✓	0	-	+	+	✓	✓	0	0	+	✓
7. Energy Storage and Transmission Systems	0	0	0	-	-	-	-	0	0	0	-	0	0	-	✓	✓	0	✓	0	0	+	-
8. Transportation	-	-	-	✓	✓	✓	✓	+	-	+	✓	✓	-	✓	+	+	-	+	-	-	✓	✓
9. Environmental/Ecological Considerations	0	0	-	-	-	✓	✓	+	+	-	✓	-	+	✓	✓	✓	+	✓	✓	✓	+	+
10. Energy Cost, Responsibility and Privilege	0	0	0	0	-	✓	✓	-	✓	0	✓	+	0	✓	-	-	✓	✓	0	0	-	+
11. Energy vs. Population vs. Food	0	0	0	-	-	-	✓	✓	0	✓	+	✓	✓	+	0	0	-	-	0	0	✓	✓
12. Energy Interdependence	0	0	0	0	-	-	✓	✓	-	+	✓	+	-	-	✓	✓	✓	-	-	0	-	✓
13. Energy Self-Sufficiency	0	0	0	0	-	-	✓	+	0	-	✓	✓	0	✓	✓	✓	✓	-	0	0	✓	+
14. Appropriate Energy Technology	0	0	0	0	-	-	-	+	-	-	-	-	0	✓	+	+	-	-	0	0	+	✓
15. Future Perspective	0	-	-	-	✓	✓	✓	✓	✓	-	✓	✓	-	✓	+	+	✓	✓	✓	-	+	✓

4. The major instructional emphasis of the modules is concept attainment. To achieve the goal of energy literacy, students must learn and understand basic natural and social science concepts along with problem-solving and decision-making skills. These concepts and skills will enable students to accurately describe and explain today's energy situation and to examine energy alternatives.

   a. The first level of concept attainment being sought is the comprehension of a concept. The ability to cite new and/or different examples demonstrates understanding or comprehension of a concept. Thus, learning experiences should include opportunities for students to manipulate newly learned concepts. Students should be encouraged to discuss main ideas of the concept, define a concept in their own words, use vocabulary associated with the concept, and cite new examples of the concept.

   b. The second level of concept attainment being sought is the application of concepts to energy-related issues. In other words, concepts become most useful when they are applied to relevant or personal problem-solving situations.

5. Most young children in the primary grades (K-3) are not able to deal with abstract concepts. Therefore, the suggested activities reflect and emphasize student awareness of energy use and the environment rather than a formal study of energy. In the upper grade levels (grades 4-12), however, students can be made aware of problems and issues of energy through concepts and use of energy-related language.

6. The skills and attitudes associated with the various thematic areas of instruction should be incorporated into appropriate energy education activities whenever possible. This has been done for Environmental Education. For the other thematic areas, refer to the guides on Career Education, Guidance, Library Skills, Student Activities and Values Education for suggestions. The major goals of these areas are:

   a. Career Education: (1) achievement of self-realization; (2) development of capability to maintain social relationships; (3) development of capability to fulfill civic responsibility; and (4) development of capability to achieve economic efficiency through producer and consumer roles.

   b. Foundation Guidance Program: (1) personal growth and development; (2) social growth and development; (3) educational planning and development; and (4) career planning and development.

   c. Library Skills: To help students develop the skills needed to become independent, resourceful users of information.

   d. Student Activities: To provide experiences which will enable each individual to learn to think and act intelligently in achieving maximum self-fulfillment and in preserving, and contributing to the strength of his/her school, community, state, nation and world.

   e. Values Education: To help each individual become a self-fulfilling, fully functioning person.

7. Because the core themes are statements derived from many existing community perspectives, their educational use is not necessarily limited to specific subject areas. They can be applied to a number of subject areas as individual unit themes or as combined study cores while maintaining the integrity of each subject area. Where appropriate, the activities suggested are interdisciplinary and/or multidisciplinary.

8. Since there are many interrelationships among the core themes, some of the suggested classroom activities have been listed in an emphasized area rather than within several themes. For example, the modules for grades K-3, activities related to Theme 5, "Human Dimensions of Energy," have been incorporated into Theme 4, "Conservation," to simplify the lessons for the primary school children. In the description of the appropriate sample activities of Theme 4, this relationship is noted as "(Related Core Theme: 5)."

9. The background information for each theme has been written for all teachers from kindergarten through the secondary school. The objectives and concepts are broad and general statements which are common to all grade levels (K-12). They differ only in the degree to which students in various grade levels attain them.

10. The suggested activities listed as "Things To Do" become more and more complex and sophisticated as students progress through the grade levels.

11. The modules are intended to give the teacher an orientation, background information and general suggestions for teaching activities related to energy use and the environment. It is hoped that teachers will use these materials as a starting point and be encouraged to adapt and create lessons in meeting the need for developing an "energy literate" population. For example, if teachers select core themes which do not have "Things To Do" and/or "Sample Activity" pages, they are encouraged to follow the format of sample activities given in the modules. They should consider:
    a. Foundation Program Objectives (FPO's) and Essential Competencies (EC's);
    b. Energy education core theme objective and concepts;
    c. Goals and/or general objectives of environmental education and other subject and thematic areas of instruction; and
    d. Instructional objectives of subject areas appropriate to the lesson being developed.

ESSENTIAL COMPETENCIES

Appropriate essential competencies (EC's) are listed for each sample activity. These are taken from the fifteen competencies identified by public validation to be the minimum required for every high school graduate to function in the adult world as productive and contributing members of society. The essential competencies are: [6]

1. Read and use printed materials from daily life.
2. Complete commonly used forms.
3. Demonstrate writing skills commonly used in daily life.
4. Communicate orally in situations common to everyday life.
5. Use computational skills in situations common to everyday life.
6. Read and use scales on standard measuring devices.
7. Interpret common visual symbols.
8. Reach reasoned solutions to commonly encountered problems.
9. Distinguish fact from opinion in TV and radio news broadcasts, advertising, newspaper and magazine articles, and public speeches.
10. Use resources for independent learning.
11. Identify the harmful effects of smoking, drinking, drug abuse, overeating, insufficient sleep, poor personal hygiene, and poor nutrition.
12. Identify the training, skill and background requirements of at least one occupation in which the student is interested.
13. Demonstrate knowledge of the basic structure and functions of national, state and local governments.
14. Demonstrate knowledge of the citizen's opportunities to participate in political processes.
15. Demonstrate knowledge of important citizen rights and responsibilities.

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[6] Student Performance Expectations of the Foundation Program, Department of Education, August, 1978.

SYMBOL KEY FOR SUBJECT AREAS, THEMATIC AREAS, AND CORE THEMES

The following abbreviations are used throughout the modules to indicate the subject and/or thematic areas related to the energy education activities.

Elementary/Secondary

Subject Areas

Art	Art
H	Health
LA	Language Arts
M	Mathematics
Mus	Music
PE	Physical Education
Sc	Science
SS	Social Studies

Additional Secondary Subject Areas

Ag	Agriculture
AEP	Asian, European and Pacific Languages
BPA	Basic Practical Arts
Bus	Business Education
HEc	Home Economics
IA	Industrial Arts
IT	Industrial-Technical Education

Thematic Areas

CE	Career Education
EE	Environmental Education
G	Guidance
LS	Library Skills
SA	Student Activities
VE	Values Education

The following numbers are used throughout the module to indicate the core themes related to a specific sample activity.

Core Themes

1. Energy Fundamentals
2. Evolution of Energy
3. Energy Today
4. Conservation
5. Human Dimensions of Energy
6. Energy Alternatives
7. Energy Storage and Transmission Systems
8. Transportation
9. Environmental/Ecological Considerations
10. Energy Cost, Responsibility and Privilege
11. Energy vs. Population vs. Food
12. Energy Interdependence
13. Energy Self-Sufficiency
14. Appropriate Energy Technology
15. Future Perspective

THEME 1. ENERGY FUNDAMENTALS

BACKGROUND

Theme 1 deals with a definition of energy and the basic laws of science and mathematics as they apply to the study of energy and its technological implications. Understanding of these energy fundamentals will help students appreciate the vital role that energy plays in their lives. This theme will also enable them to understand options, make decisions and/or take positive problem-solving actions which are related to energy use and the environment.

FOUNDATION PROGRAM OBJECTIVES

FPO 1. Develop basic skills for learning and effective communication with others.
FPO 2. Develop positive self-concept.
FPO 3. Develop decision-making and problem-solving skills at the student's proficiency level.
FPO 4. Develop independence in learning.

CORE THEME OBJECTIVE

To apply laws of science and mathematics to the study of energy.

CONCEPTS

1. Energy is the capacity to do work and is subject to natural laws.
2. All living things and natural processes require energy.
3. The sun is the basic source of energy on earth.
4. Energy exists in many forms.
5. Energy can neither be created nor destroyed but can be converted from one form to another.

THEME 1. Energy Fundamentals

RELATED GOALS AND/OR GENERAL OBJECTIVES OF SUBJECT AREA GUIDES

AGRICULTURE: (pg. 54-56 - Units I & II) The application of scientific principles aids people to cultivate economic plants. People's ability to bring about optimal conditions for animal growth and development is dependent upon their scientific knowledge and technical skills.

BASIC PRACTICAL ARTS: (pg. 4 - Objective) To effectively meet the basic necessities of life in order to sustain life to the optimum.

HEALTH: (pg. 1 (7-12) - Goal) Through a developmental health education program, students will acquire accurate health information, and gain experience contributing to attitudes, values and responsible health practices; students will be able to make decisions relating to their health and understand how these decisions affect them and the society in which they live.

HOME ECONOMICS: (pg. iii - Objective) Purchase consumer goods and services appropriate to an overall consumption plan and wise use of economic resources.

INDUSTRIAL ARTS/INDUS-TECH: (pg. 2 - Objective) Develop an understanding of the principles, concepts, and problems of industrial technology.

MATHEMATICS: (pg. 13 - Goals) Develop ability to think critically and to solve problems.

PHYSICAL EDUCATION: (pg. 106 - Objective) Move skillfully and know the concepts relevant to all physical movement.

SCIENCE: (pg. 13 - Objectives) 1. Nurture in our children a curiosity and excitment about the biophysical environment. 2. Teach students to value science as one way of learning and communicating effectively about self, others and the environment. (Develop a longing to know and understand.)

SOCIAL STUDIES: (pg. 11 - Objective) The student is able to interpret and accurately use symbols, figures, and models by which scientifically gathered information is related and displayed (e.g., maps, tables, graphs, charts).

THEME 1. Energy Fundamentals

Subject Area SS

Grade Level 7-12

THINGS TO DO (Grade 7)

1. Identify and describe the culture of ancient Hawaii. How was the knowledge of energy principles illustrated in the ancient culture? Describe some of their tools. Were they able to convert energy from one form to another? Could they transmit energy from one place to the next? How did their tools make use of energy? Show or explain the basic laws of energy used in making their tools. Construct a tool similar to one used by the ancient Hawaiians and demonstrate its use to the class.

2. Research and report on ancient Hawaiians' feelings toward the sun. Did they believe that the sun was a source of energy? Explain. Who were Kane and Haleakala? In what way are they related to the sun?

3. Make a model of an ancient Hawaiian imu. Explain how the imu uses principles of energy transfer and energy conservation. What other energy fundamentals are illustrated? What energy fundamentals does a kukui nut candle illustrate? Can you think of other ancient Hawaiian objects or activities that illustrate energy principles?

THINGS TO DO (Grade 8)

*1. Go out into the environment and observe energy in action. Be sure to use all five (5) senses. (See Sample Activity 1-1. "A Walk With Energy.")

2. Calculate the amount of electricity you and your family use each day. Express your answer in kilowatts. Translate your answer into dollars.

3. Make a collage showing how primary energy sources are converted to more usable forms. Share your collage with students in the lower grades.

4. Make a bulletin board display called "Energy Fact of the Week." Each week have fellow classmates share an energy fact or principle. Each fact or principle should be illustrated.

THINGS TO DO (Grade 9)

1. List ways that show people's understanding that energy is the basis of all life. Throughout history, how did people use the sun as a source of energy? When were humans first aware of energy as a source of power?

2. Demonstrate tools and weapons used in different primitive cultures. How do these tools and weapons show an understanding of energy concepts?

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*For detailed description, refer to noted Sample Activity

THINGS TO DO (Grade 9) (Cont'd.)

3. Investigate the principles of energy use and conservation in early American architecture. For an international perspective, correlate energy principles used in building houses and other structures in other lands. What kinds of materials (natural resources) are needed to make different homes, e.g., paper type houses in Japan; adobe in Mexico; wood in the U.S.; and stone in Europe?

THINGS TO DO (Grade 10)

1. Show your understanding of energy by creating a short skit for use with elementary students. Present your skit to a neighboring school.

2. Make a list of all activities throughout the day that involve the use of energy. Compare your list with your classmates'. Did you forget any item? Would you be willing to give up some of the activities? How much fossil fuel energy do you use in a day?

THINGS TO DO (Grade 11)

1. Make a map of the various Hawaiian Islands. Indicate on the map the amount of sunshine received each year. (Data is available from the Weather Station.) Record the number of sunny days in a year. Choose one area in continental U.S.A., e.g., the Southwest, and do the same thing. Compare the two areas. Are they alike? Why or why not? What makes Hawaii unique? Why is Hawaii considered a good site to test alternate energy sources?

2. Choose one luxury item you take for granted such as a transistor radio. Explain the energy used to operate it. Explain the energy used to produce it. Do you know how it works? Do you think that if people knew more about how or why things work they could take better care of them? Explain why understanding of energy principles may make you a better conservationist.

Note: Suggested activities could also be used by students taking related electives in grades 11 and 12.

VOCABULARY

Conservation, culture, energy, fossil fuel, kilowatt, power, primary energy, stored energy, transformation of energy, watt, work.

THEME 1. Energy Fundamentals

Subject Area SS (LA, Sc)
Thematic Area EE, G, VE
Grade Level 8

SAMPLE ACTIVITY 1-1. "A Walk With Energy"

OBJECTIVE

- To apply laws of science and mathematics to the study of energy.

CONCEPTS

- Energy is the capacity to do work and is subject to natural laws.
- All living things and natural processes require energy.
- Energy exists in many forms.

ESSENTIAL COMPETENCIES

- EC 3. Demonstrate writing skills commonly used in daily life.
- EC 4. Communicate orally in situations common to everyday life.
- EC 7. Interpret common visual symbols.
- EC 10. Use resources for independent learning.

RELATED ENVIRONMENTAL EDUCATION INSTRUCTIONAL GOALS AND/OR OBJECTIVES

- Students will support and practice wise utilization of traditional sources of energy and also support research and development of alternate energy sources. (Goal: pg. D2)
- Students will demonstrate an appreciation for the interdependence of living things in the closed earth system. (Goal: pg. D30)

SOCIAL STUDIES INSTRUCTIONAL OBJECTIVES

- Identify the major social and environmental problems confronting American society today, describe and explain some probable causes and the effects on the nation and its people. (Objective: pg. 28)
- Identify the major economic and consumer problems confronting American society today, describe and explain some probable causes and the effects on the nation and its people. (Objective: pg. 28)

SUGGESTED MATERIALS AND/OR RESOURCES

Exercise 1.1.

Theme 1. Energy Fundamentals

Sample Activity 1-1

Grade Level 8

ACTIVITY (Related Core Themes: 3, 4 & 9)

In order to understand the issues and problems related to energy use, students need to have a better understanding of what energy is, what it does and how we make it work for us. Life on earth as we know it, could not exist without energy.

Although social studies classes may not be concerned with the mathematical or scientific definition of energies, they have a lot to contribute in promoting a better understanding of the nature of energy. A better understanding of energy comes about when students can use their communication skills to express how they perceive energy. In order to communicate, the students need to use all of their senses and hopefully this will help the individual student learn, question, understand and appreciate the nature and value of energy.

In this activity students will get a chance to share their own experiences and insights about energy by using their senses in an energy walk.

1. Discuss with students that energy makes things go or move. After a brief discussion of the kinds of energy, prepare them for an energy walk.
2. Tell students while on the energy walk, that the first 20 minutes is a silent walk, i.e., no talking is allowed but if they wish to call attention to something they are allowed to point to it. (See Exercise 1.1.)
3. Ask students to share their experiences from their energy walk.
4. Ask them to write an essay explaining the title "A Walk With Energy." What does it mean? Is it talking about the environment or you or both?

SUGGESTED FOLLOW-UP/ASSESSMENT ACTIVITIES

1. Bring back feelings about one form or type of energy from the environment. Explain through a skit, play, slide-tape show, poem, original story, etc., the nature of the energy and what it does.
2. Tell how the form of energy you selected can be conserved.

36

Theme 1. Energy Fundamentals — Sample Activity 1-1

Exercise 1.1 — Grade Level 8

"A Walk With Energy"

Directions: Go out into the environment and observe energy.

PART I: Silent Walk (10 minutes)

1. List five things touched by energy.

2. List five sources and/or kinds of energy.

PART II: Using our Senses

1. Give an example of energy that you can:
    a. feel but not see
    b. feel but not hold
    c. see but not feel
    d. hear but not see
    e. see but not taste
    f. smell but not see
    g. other (make up your own)
2. Describe energy in exactly ten words; five words.

3. Write an original poem about your feelings about energy. If you like, illustrate your written creation with drawings, collage, pictures, etc.

THEME 2. EVOLUTION OF ENERGY

BACKGROUND

In this theme, history is interpreted in terms of the level of energy conversion technology in relation to the evolution of energy consumption. The discovery, development and consumption of energy resources in different cultures are traced over thousands of years. This theme also indicates that energy consumption evolved from initially meeting basic needs of humans to later satisfying "wants" of industrialized societies as well.

The historical perspective of this theme will enable students to appreciate the essence of energy in the lives of humans and the primary role energy has played in shaping the history of western civilization and the world. It will also help them to recognize some of the societal problems and benefits created by the growth of science and technology.

FOUNDATION PROGRAM OBJECTIVES

FPO 1. Develop basic skills for learning and effective communication with others.
FPO 2. Develop positive self-concept.
FPO 4. Develop independence in learning.
FPO 8. Develop creative potential and aesthetic sensitivity.

CORE THEME OBJECTIVE

To understand the historical development of sources and uses of energy.

CONCEPTS

1. History can be interpreted in terms of the discovery, development, and use of energy sources ranging from human power to fossil fuels.
2. Energy use evolved from meeting basic needs of primitive cultures to satisfying "wants" of highly industrialized societies.
3. Energy conversion technology evolved to make more efficient use of energy sources to perform useful work.
4. The development of energy conversion technology affected and was affected by the growth of differing societal, governmental, political, economic, and cultural systems.
5. Hawaii's history of energy use shows a movement from dependence entirely on local sources of energy to dependence on energy sources outside Hawaii.

THEME 2. Evolution of Energy

RELATED GOALS AND/OR GENERAL OBJECTIVES OF SUBJECT AREA GUIDES

AGRICULTURE: (pg. 57 - Unit V) Technical advancement permits larger volume production systems and requirements.

ART: (pg. 7 - Objective) Acquire knowledge of and an appreciation for people's cultural heritage by exposure to and discussion about works of art from many cultures and times.

ASIAN, EUROPEAN AND PACIFIC LANGUAGES: (pg. 5 - Goal) To develop an understanding of the literary, historical and cultural heritage of the people whose language is studied.

BASIC PRACTICAL ARTS: (pg. 4 - Objective) To develop the ability to cope with change.

BUSINESS EDUCATION: (pg. V - Objective) To live effectively in today's economic environment.

HOME ECONOMICS: (pg. iii - Objective) Develop mutual understanding and appreciation for differing cultures and ways of life, and cooperate with people of other cultures who are striving to raise levels of living.

INDUSTRIAL ARTS/INDUS-TECH: (pg. 2 - Objective) Develop an appreciation of the human-made world and the products of a managed-production system which satisfy the needs and wants of people.

LANGUAGE ARTS: (pg. 4 - Goal) To enrich and extend student experiences and understanding of literature.

MUSIC: (pg. 2 - Objective) Compare and analyze music of various historical periods and styles.

SCIENCE: (pg. A-13 - Objective) Foster the students' appreciation for the practical and aesthetic contribution of science to the improvement of the quality of life and to promote in our students the desire to take an active part in that contribution.

SOCIAL STUDIES: (pg. 11 & 12 - Objectives) 1. The student knows historically documented facts about people, places, events, inventions, institutions, etc., of traditional or practical significance to communities of which he or she is a member. 2. The students knows scientifically validated facts about the social, political, and economic behavior of humans and human organizations in a variety of times and environments. 3. The student values contributions of history and the social sciences to his or her growing philosophy with regard to self, others, and the environment.

39

THEME 2. Evolution of Energy

Subject Area SS

Grade Level 7-12

THINGS TO DO (Grade 7)

*1. Make a time-line mural or chart depicting the history of energy use in Hawaii. (See Sample Activity 2-1. "From Kapus to Car Pools.")

*2. Find out more about the kinds of and sources of energy used during different time periods in Hawaii's history. (See Sample Activity 2-2. "Petrol-genesis.")

3. Compare the energy used by ancient Hawaiians in satisfying basic needs. How does it compare with today's needs? What are some of the resultant changes in lifestyle, clothing, food, housing, etc.?

4. Trace the development of transportation during various time periods in Hawaii's history. How were goods and services transported? What fuels were used? Compare the energy use, cost, efficiency and benefit of various modes of transportation.

5. Today's recreational activities consume tremendous amounts of energy. Compare recreational activities of ancient Hawaiians to those of people living today. How are they different? How are they the same? How do the use of natural resources differ? Do the recreational activities today have to be so energy intensive? Create a game or leisure time activity that uses little or no fossil fuel energy. If you wish, pattern it after an ancient Hawaiian game. Share it with the class.

6. Learn more about the various immigrant groups that have come to Hawaii. What customs did they bring that influenced energy consumption? Did any of their customs affect the environment? Are any of these customs practiced today?

7. Compare the arts and crafts of ancient Hawaiians with those of today. How are they alike? Different? Are any of the ancient crafts being practiced today? Have the Hawaiian crafts become more energy intensive? Explain.

THINGS TO DO (Grade 8)

*1. Make a list of all the appliances in your home that use electricity. Next, make a list of appliances used in your mother's and grandmother's time that is comparable to your list. Compare the amounts of electricity used. (See Sample Activity 2-3. "The Work Shift.")

2. Trace the growth of the use of energy from the colonial period to the present. (See Energy Transitions in U.S. History, Interdisciplinary Student/Teacher Materials in Energy, the Environment, and the Economy (EEE), Department of Energy, June 1979.)

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*For detailed description, refer to noted Sample Activity.

THINGS TO DO (Grade 8) (Cont'd)

3. Find out why coal replaced wood as the major source of energy after 1885 and how it affected the nation. (See Energy Transitions in U.S. History, Interdisciplinary Student/Teacher Materials in Energy, the Environment, and the Economy (EEE), Department of Energy, June 1979, pp. 81-91.)

4. Study the growth of agricultural methods over the years starting with the colonial farmers. How has farming become more energy intensive over the years? (See Agriculture, Energy and Society, Interdisciplinary Student/ Teacher Materials in Energy, the Environment, and the Economy (EEE), Department of Energy, September, 1978.)

5. Watch the Waltons or Little House on the Prairie on televison. Compare the lifestyle of the time periods depicted with that of today. What is the relationship of energy consumption and lifestyles? While watching the programs, list the energy sources observed. How many of the activities are related to fossil fuels?

THINGS TO DO (Grade 9)

*1. Trace the development of energy use over different time periods in world history. What effects did technological developments have on the world? (See Sample Activity 2-4. "In Search of Power.")

2. What fuel crises occurred in the 13th to 17th centuries? What environmental impacts and problems accompanied the shift from wood to coal as an energy source?

3. Trace the development of energy use from the days of the cave person to the present. At what points in history were great technological advances made that spurred the use of energy sources?

4. Delineate the relationship between energy consumption and various cultures and countries. Do mores and customs affect energy use? What other sociological factors affect energy use?

5. International wars often have been fought because one nation wanted more resources. Review the wars fought since 1900. Give examples of wars or conflicts motivated by the quest for resources. Make a chart listing the various wars and conflicts, the year it occurred, and the resources sought.

6. Conduct an in-depth study of people's use of energy from pre-history to the present and its influence upon cultural migration, and the development of different societies.

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*For detailed description, refer to noted Sample Activity

Theme 2. Evolution of Energy

Subject Area SS

Grade Level 7-12

THINGS TO DO (Grade 10)

*1. Study various news headlines that concern energy and determine the year each was written. Are there headlines of the past that could be used today? (See Sample Activity 2-5. "Play It Again, Sam.")

2. Describe the effects of the Industrial Revolution on the daily lives of people, industry, the economy, energy use, and the environment. (See Energy, Engines, and the Industrial Revolution, Interdisciplinary Student/Teacher Materials in Energy, the Environment, and the Economy (EEE), Department of Energy, October, 1977).

3. The scarcity of resources is not new. In the past, problems of scarcity were usually associated with wars. Find out more about the energy and resource problems faced in the Revolutionary War, Civil War, and World Wars I and II. How are the problems of scarcity of resources during these time periods similar to our problem today? How are they different? How were these problems resolved or addressed?

4. Gather data and examine charts that show the consumption of minerals and fuels from 1900 to present. What implications are shown by the charts and data regarding their future use? If we continue to use our resources at the present rate, when will we run out of various minerals and fuels? Which minerals can we do without? Which ones are necessary?

5. Compare the farming methods of the American Revolution and Civil War periods. What revolutionary ideas spurred farmers to become energy intensive? Compare those two periods to present day. How have tools (machinery) and methods changed? Does the use of modern tools and equipment also mean that we are more cost/efficient today? Explain. Are farming methods more energy efficient today? Explain.

6. Draw "energy cartoons" with captions, illustrating how the Populist farmers reacted to industrialization after the Civil War. Write a short paragraph to explain and support your interpretation.

THINGS TO DO (Grade 11)

1. Determine those events in the past 50 years which have led to the utilization of greater amounts of energy. Was the impact on an international, national, state, or local scale? For example, building a national network of freeways; advertising that bigger cars are safer; lighting streets for safety; etc. Explore at least five (5) events and their implications.

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*For detailed description, refer to noted Sample Activity.

THINGS TO DO (Grade 11) (Cont'd)

2. Make a list of games, puzzles, and diversions that are commercially produced versions of activities that formerly were homemade using common household items (pencil and paper, a few marbles, toothpicks, etc.). Why are the sales of these items so successful? Relate this to generic principles that underline attitudes regarding the general American lifestyle--affluence, status, materialism, prestige, etc.

3. Make a time-line chart showing how the understanding and/or discovery of various energy concepts affected our society.

4. Make a pictorial chart showing the discovery and/or development of energy resources in Hawaii. Does Hawaii have any fossil fuel resources? At what point did we have to look elsewhere for energy resources? What factors in Hawaii's history accounted for growing dependence on foreign oil?

5. Trace the development of the use of energy in the sugar industry. When did the change from a labor intensive industry to one that is energy intensive take place? Was this change gradual or did it occur suddenly? What factors influenced the change?

Note: Suggested activities could also be used by students taking related electives in grades 11 and 12.

VOCABULARY

Change, convenience, cost/efficient, energy, energy intensive, fossil fuel, labor intensive, lifestyle, luxuries, needs, scarcity, technology, wants.

43

THEME 2. Evolution of Energy

Subject Area	SS
Thematic Area	EE
Grade Level	7

SAMPLE ACTIVITY 2-1. "From Kapus to Car Pools"

OBJECTIVE

- To understand the historical development of sources and uses of energy.

CONCEPTS

- History can be interpreted in terms of the discovery, development, and use of energy sources ranging from human power to fossil fuels.
- Energy use evolved from meeting basic needs of primitive cultures to satisfying "wants" of highly industrialized societies.
- Energy conversion technology evolved to make more efficient use of energy sources to perform useful work.
- The development of energy conversion technology affected and was affected by the growth of differing societal, governmental, political, economic, and cultural systems.
- Hawaii's history of energy use shows a movement from dependence entirely on local sources of energy to dependence on energy sources outside Hawaii.

ESSENTIAL COMPETENCIES

- EC 3. Demonstrate writing skills commonly used in daily life.
- EC 4. Communicate orally in situations common to everyday life.
- EC 8. Reach reasoned solutions to commonly encountered problems.
- EC 10. Use resources for independent learning.

RELATED ENVIRONMENTAL EDUCATION INSTRUCTIONAL GOALS AND/OR OBJECTIVES

- Students will support and practice wise utilization of traditional sources of energy and also support research and development of alternate energy sources. (Goal: pg. D2)
- When faced with decisions concerning the use of earth resources, students will select practices developed in recognition of present and future environmental and human needs. (Goal: pg. D6)
- Students will examine optional courses of action and their consequences for improving the quality of life and will support those that will provide optimum short- and long-term benefits for society and the environment. (Goal: pg. D38)

Theme 2. Evolution of Energy

Sample Activity 2-1

Grade Level 7

SOCIAL STUDIES INSTRUCTIONAL OBJECTIVES

- Identify, describe, and explain the major periods and movements in Hawaiian history in the pre-modern era that influenced the growth and development of Hawaii. (Objective: Grade 7, pg. 25)
- Identify and define the distinctive features that characterize Hawaii today (social, political, economic, religious, etc.) as seen through influence from the past. (Objective: Grade 7, pg. 25)

SUGGESTED MATERIALS AND/OR RESOURCES

Materials for mural and/or poster.

Sample Activity 2-1

Grade Level 7

ACTIVITY (Related Core Themes: 3, 4, 5 & 9)

History can be described in terms of the harnessing of energy sources to do useful work. The development of energy sources affected and was affected by the growth of differing societal, governmental, political, economic and cultural systems.

Here in Hawaii, the exposure to other people, technology, life styles, etc., fostered the movement from dependence on local sources of energy to energy sources outside Hawaii.

Today Hawaii imports all of its materials and energy sources from outside the state. We have moved from one kind of restriction, Kapus, to a type of constriction, car pools.

1. Discuss with students how they use energy today. Ask them to give some examples of energy used at home, school and play. Did the ancient Hawaiians use similar kinds of energy?
2. Have students make a time-line mural or chart depicting the history of energy use in Hawaii. Have them do a chart or mural without doing research. Ask them to include energy use from pre-Cook days to present day. (Included in this activity is a chart showing the various "milestones" of energy use in history. Students may use this chart as a guide.)
3. Next, have the students read about the various kinds of energy used in Hawaii from pre-Cook days to present. Have them incorporate their findings into their chart or mural. Were the predictions accurate? Why or why not? If there are major discrepancies, how do you account for them?
4. Do another time-line this time showing, if any, the conservation measures and/or extravagance practiced during the various time periods. Were there certain time periods that conservation of natural resources was more prevalent than others? Why? What do you think accounts for this? Were there periods of extreme extravagance? Why?
5. Have students investigate the energy used by ancient Hawaiians in various activities such as recreation, agriculture, cooking, etc. Make a report to the class, demonstrating the energy used for that activity whenever possible.
6. Have students prepare a meal using the methods used by ancient Hawaiians.
7. Have students participate in an old Hawaiian game that uses objects from the natural environment. Compare the energy use of that activity with activities the students participate in today.
8. Have students write a brief paragraph explaining the title of this activity "From Kapus to Car Pools."

SUGGESTED FOLLOW-UP/ASSESSMENT ACTIVITIES

Do a time-line showing the major events in environmental or ecological movements. When were people first concerned as a group about their environment?

47

Theme 2. Evolution of Energy — Sample Activity 2-1

Teacher's Sheet - "From Kapus to Car Pools" — Grade Level 7

Supplementary Instruction Sheet

CHRONOLOGY OF EVENTS IN THE HISTORY OF HUMANS AND ENERGY[1]

1,700,000 B.C.	First Ice Age begins. Several varieties of erect, human-like primates exist.
Before 500,000	Man begins to use fire.
Before 13,000	Domestication of the dog.
9,000	Beginnings of agriculture.
8,000	Last retreat of the continental ice sheet.
7,000	First sickles, found in Palestine.
6,000	Domestication of goats, pigs, sheep, cattle, oxen.
4,000	Domestication of the horse.
3,500	Wheel invented, probably in Mesopotamia.
3,000	Man learns to smelt metal and make bronze.
1,000	Beginning of iron technology. Domestication of the camel.
300	Waterwheels in Greece.
200	Modern harness invented in China.
100	Horizontal shaft waterwheel produces 0.3 kilowatts power.
27	Book by Vitruvius describes watermills, steam jets, and machines in general.
A.D. 300	Vertical shaft waterwheel produces 2 kilowatts power.
500	Waterwheels come to Europe.
650	First windmills. Modern horse harness reinvented in Europe.
852	Coal burned in an English monastery.
900	Whale oil used for lighting.
1239	Coal used as fuel by smiths and brewers.
1300	First coal used in home heating.
1404	First giant cannon, in Austria.
1500	Tide mills in the Netherlands; windmills used to drain submerged lands and maintain them.
1600	Versailles water works produces 56 kilowatts power.
1606	First known experimental steam engine built by Della Porta.
1673	Huygens builds internal combustion engine run on gunpowder.

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[1] Data taken from Consumer Use of Energy, Kansas Curriculum Materials Dissemination Center, Pittsburg State University, Pittsburg Kansas, 1978, pg. I-19 - I 21.

Theme 2. Evolution of Energy Sample Activity 2-1

Teacher's Sheet (Cont'd.) Grade Level 7

1690	Papin designs the first piston engine.
1693	Leibnitz states the law of conservation of potential and kinetic energy.
1712	Newcomen builds first steam pumping engine.
1740	Improvements in iron technology.
1765	Modern steam engine conceived by Watt.
1789	Coulomb's work in electrostatics.
1820-1860	Work of Oersted, Ampere, Faraday, and Maxwell in electricity. Principles of thermodynamics worked out by Carnot and Clausius.
1857	First oil well drilled in Pennsylvania.
1866	Transatlantic cable laid.
1876	Otto designs four-stroke internal combustion engine.
1882	First incandescent lighting, New York.
1895	Roentgen discovers X-rays.
1896	Becquerel discovers radioactivity.
1898	Tsiolkovski works out principles of rocket flight.
1903	First flight of Wright brothers.
1920	First scheduled public radio broadcast, Pittsburgh.
1926	Goddard fires first rockets with liquid propellant.
1941	First jet plane flight.
1942	Fermi starts first atomic reactor in Chicago.
1945	First nuclear explosion, Alamogordo, New Mexico.
1952	First hydrogen bomb explosion.
1954	Launching of first atomic-powered submarine, Nautilus. First nuclear power plant put into service near Moscow, U.S.S.R.
1957	Sputnik I, first artificial satellite. First nuclear power plant in U.S., Shippingport, Pennsylvania.
1969	Man lands on the moon.

THEME 2. Evolution of Energy

Subject Area SS (Bus, LA)
Thematic Area EE (CE, LS, VE)
Grade Level 7

SAMPLE ACTIVITY 2-2. "Petrol-genesis"

OBJECTIVE

- To understand the historical development of sources and uses of energy.

CONCEPTS

- History can be interpreted in terms of the discovery, development, and use of energy sources ranging from human power to fossil fuels.
- Energy use evolved from meeting basic needs of primitive cultures to satisfying "wants" of highly industrialized societies.
- Energy conversion technology evolved to make more efficient use of energy sources to perform useful work.
- The development of energy conversion technology affected and was affected by the growth of differing societal, governmental, political, economic, and cultural systems.
- Hawaii's history of energy use shows a movement from dependence entirely on local sources of energy to dependence on energy sources outside Hawaii.

ESSENTIAL COMPETENCIES

- EC 1. Read and use printed materials from daily life.
- EC 2. Complete commonly used forms.
- EC 3. Demonstrate writing skills commonly used in daily life.
- EC 4. Communicate orally in situations common to everyday life.
- EC 8. Reach reasoned solutions to commonly encountered problems.
- EC 9. Distinguish fact from opinion in TV and radio news broadcasts, advertising, newspaper and magazine articles, and public speeches.
- EC 10. Use resources for independent learning.
- EC 13. Demonstrate knowledge of the basic structure and functions of national, state and local governments.
- EC 14. Demonstrate knowledge of the citizen's opportunities to participate in political processes.
- EC 15. Demonstrate knowledge of important citizen rights and responsibilities.

RELATED ENVIRONMENTAL EDUCATION INSTRUCTIONAL GOALS AND/OR OBJECTIVES

- Students will demonstrate their awareness of population processes and dynamics. (Goal: pg. D23)
- Students will demonstrate an appreciation for the interdependence of living things in the closed earth system. (Goal: pg. D30)
- Students will examine optional courses of action and their consequences for improving the quality of life and will support those that will provide optimum short- and long-term benefits for society and the environment. (Goal: pg. D38)

Theme 2. Evolution of Energy

Sample Activity 2-2

Grade Level 7

SOCIAL STUDIES INSTRUCTIONAL OBJECTIVES

- Identify, describe, and explain the major periods and movements in Hawaiian history in the pre-modern era that influenced the growth and development of Hawaii. (Objective: pg. 25)
- Identify and define the distinctive features that characterize Hawaii today (social, political, economic, religious, etc.) as seen through influences from the past. (Objective: pg. 25)

SUGGESTED MATERIALS AND/OR RESOURCES

1. Exercise 2.2.
2. Library books on history of Hawaii.

51

Sample Activity 2-2

Grade Level 7

ACTIVITY (Related Core Themes: 3)

History can be described in terms of the level of energy conversion technology in relation to the evolution of energy consumption. The development and use of energy in Hawaii from the period before Captain Cook's arrival to the present reflects our economic growth, our changing life styles as well as our movement away from complete self-sufficiency to almost complete dependency.

In this activity, students will get an opportunity to see the gradual changes in this direction.

1. Discuss and/or review with the class the various types of energy they use everyday. Ask them what kinds of energy they think the ancient Hawaiians used. Have them investigate to find out the energy sources used during different time periods in Hawaii's history. Have them do Exercise 2.2. (This Exercise could be done as a class project with each group taking one time period. Chart could be made larger and the various student groups could draw, write, paste pictures, in the appropriate spaces.)
2. Discuss energy use in relation to a) economic growth; b) life styles and c) energy self-sufficiency. (See Part II - Questions for Discussion in Exercise 2.2.)

SUGGESTED FOLLOW-UP/ASSESSMENT ACTIVITIES

Write a short story or a skit or a slide show showing what life was like for a typical family in one of the time periods shown on the chart. Be sure to pay special attention on the kinds of energy used.

Theme 2. Evolution of Energy

Exercise 2.2

Sample Activity 2-2

Grade Level 7

"Petrol-genesis"

Directions:
1. Find out more about the kinds of and sources of energy used during different time periods in Hawaii's history and fill in the information in the chart in Part I.
2. After filling out the Time Chart, answer the questions in Part II.

PART I: Hawaii's Energy Time Chart

Types and Uses of Energy	TIME PERIODS IN HAWAII'S HISTORY					
	Ancient Hawaii - age of the ahupuaa	Hawaii in Transition - coming of Cap't.Cook	Agricultural Hawaii - age of sugar and pineapple	Hawaii's changing Economy - military and tourism	Hawaii Today - industrial state	Hawaii - the Future
	(before 1778)	(1778-1850)	(1850-1941)	(1941-1971)	(1971-Present)	(Present →
What kind(s) of energy was (is) used and/or produced?						
How was (is) energy used and/or produced? Was (it) produced locally?						
For whom was (is) energy produced? How was (is) energy used?						
How was (is) energy allocated or distributed?						
Who had (has) the power to make decisions regarding the production and distribution of energy?						

THEME 2. Evolution of Energy

Subject Area SS (Art, Bus, LA, Sc)
Thematic Area EE (CE, G, LS, VE)
Grade Level 8

SAMPLE ACTIVITY 2-3. "The Work Shift"

OBJECTIVE

- To understand the historical development of sources and uses of energy.

CONCEPTS

- History can be interpreted in terms of the discovery, development, and use of energy sources ranging from human power to fossil fuels.
- Energy use evolved from meeting basic needs of primitive cultures to satisfying "wants" of highly industrialized societies.
- Energy conversion technology evolved to make more efficient use of energy sources to perform useful work.
- The development of energy conversion technology affected and was affected by the growth of differing societal, governmental, political, economic, and cultural systems.
- Hawaii's history of energy use shows a movement from dependence entirely on local sources of energy to dependence on energy sources outside Hawaii.

ESSENTIAL COMPETENCIES

- EC 1. Read and use printed materials from daily life.
- EC 2. Complete commonly used forms.
- EC 3. Demonstrate writing skills commonly used in daily life.
- EC 4. Communicate orally in situations common to everyday life.
- EC 5. Use computational skills in situations common to everyday life.
- EC 6. Read and use scales on standard measuring devices.
- EC 8. Reach reasoned solutions to commonly encountered problems.
- EC 10. Use resources for independent learning.
- EC 13. Identify the training, skill and background requirements of at least one occupation in which the student is interested.

RELATED ENVIRONMENTAL EDUCATION INSTRUCTIONAL GOALS AND/OR OBJECTIVES

- When faced with decisions concerning the use of earth resources, students will select practices developed in recognition of present and future environmental and human needs. (Goal: pg. D6)
- Students will examine optional courses of action and their consequences for improving the quality of life and will support those that will provide optimum short- and long-term benefits for society and the environment. (Goal: pg. D38)

Theme 2. Evolution of Energy

Sample Activity 2-3

Grade Level 8

SOCIAL STUDIES INSTRUCTIONAL OBJECTIVES

- Identify the major economic and consumer problems confronting American society today, describe and explain some probable causes and the effects on the nation and its people. (Objective: pg. 28)
- Identify significant personal problems confronting oneself today and possibly in the future, describe and explain some probable causes and effects on the individual presently and in the future. (Objective: pg. 28)

SUGGESTED MATERIALS AND/OR RESOURCES

Exercise 2.3.

Theme 2. Evolution of Energy

Sample Activity 2-3

Grade Level 8

ACTIVITY (Related Core Themes: 1, 3, 10)

Increases or decreases in energy consumption usually reflect changes in one's life style. The study of history shows that as the standard of living increased, the consumption of energy followed suit. The "good life" was accompanied by the satisfaction of not only basic needs but increasing wants. We have now entered an era where we have unlimited wants but limited resources. How did all of this come about? When did the work being done shift from human labor to machines? When did we switch from being labor intensive to being energy intensive?

In this activity students are provided with an opportunity to inventory the amount and variety of their families' energy use in the home. Through the inventory they also gain some idea of how energy use and consumption changed in the past 40 years. Based on their findings students are asked to make predictions about future energy demands.

1. Discuss with the students their present use of electricity. Ask them what they use electricity for. Write their responses on the board. Ask them if they think people had these same uses for electricity 10 years ago, 30 years ago, etc.
2. Discuss how the amount and variety of electrical use has changed over the years. Then have them do Exercise 2.3.

SUGGESTED FOLLOW-UP/ASSESSMENT ACTIVITIES

1. Trace the development of new jobs and careers and how energy conversion technology developed.
2. Make a picture mural using either magazine pictures, photographs or your own drawings showing the growth of technology and its effects on jobs and careers.

Theme 2. Evolution of Energy — Sample Activity 2-3

Exercise 2.3 — Grade Level 8

"The Work Shift"[1]

Directions:

1. Compare Figure 1 by listing all the appliances in your home that require electricity (energy) to operate. (Ask your parents to help you with the chart if you are not sure what you have around the house.)
2. Place a check (✓) next to the ones you and your family currently use in the Now column under "Appl. Used."
3. Next have your parents place a check mark (✓) in the 10 years ago and 20 years ago columns for those appliances which they had available 10 and 20 years ago. (If there were other electrical appliances available 10 and 20 years ago that do not appear on your list, add them to your list and check the appropriate columns.)
4. Ask your grandparents or elders in your community to check those items on the Now list that were used 30 and 40 years ago. (If there were other electrical appliances available 30 or 40 years ago that do not appear on the list, add them to the list and check the appropriate columns.)
5. For each time period, record the number of people who were in the family at that time.
6. Using the Electrical Energy Use Chart, Figure 3, fill in the estimated total kilowatt hours per month used by each appliance in Chart I and add up the total for each time period.
7. Calculate the kilowatt hour usage per month per person by dividing the total kilowatt hours per month by the number in the family at each time interval. Graph your results in Figure 2.

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[1] Adapted from Teachers Resource Guide for Environmental Education, Arizona Department of Education, Phoenix, Arizona, 1977, pp. 72-74.

Theme 2. Evolution of Energy

Sample Activity 2-3

Exercise 2.3

Grade Level 8

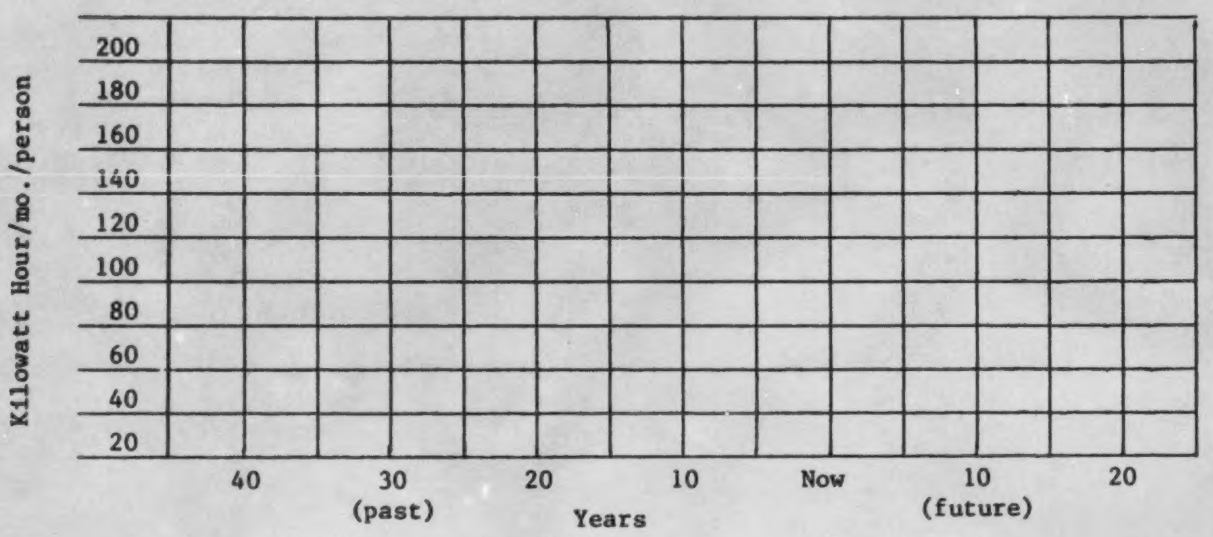
FIGURE 1 - Individual Energy Use Chart

APPLIANCE	NOW		10 Years Ago		20 Years Ago		30 Years Ago		40 Years Ago	
	Appl. Used	Kwh/mo.	Appl. Used	Kwh/mo.	Appl. Used	Kwh/mo.	Appl. Used	Kwh/mo.	Appl. Used	Kwh/mo.
TOTAL Kwh/mo.										
No. in family										
Kwh/mo./person										

Theme 2. Evolution of Energy — Sample Activity 2-3

Exercise 2.3 (Cont'd.) — Grade Level 8

FIGURE 2 - Graph of Kilowatt Hour Usage Per Month Per Person



Questions for discussion:

1. Does the completed chart accurately reflect the total energy used to maintain the life style today? 10 years ago? 20 years ago? 30 years ago? 40 years ago? What information is missing? How can you represent the energy used more accurately?
2. Using your graph, predict the use of electricity per person 10 years from now; 20 years from now. What might affect the accuracy of your predictions?
3. Were there any major events and/or movements that influenced energy use and production in any of the time periods? If so, describe the event or movement and the effect.
4. Trace the development of changing roles (rights and responsibilities) of citizens residing in the United States over the past years, starting with the Colonial period.
5. If you had the authority to decide how our resources should be used and/or developed, what are some of the decisions you would make? Why?

Theme 2. Evolution of Energy — Sample Activity 2-3

Exercise 2.3 (Cont'd,) — Grade Level 8

FIGURE 3 - Electrical Energy Use Chart

Estimated Energy Consumed by Home Appliances in a Month

	Average wattage	Estimated kilowatt hours monthly
Food Preparation		
Blender	390	1
Broiler	1,440	8
Carving knife	92	1
Coffee maker	890	9
Deep Fryer	1,450	7
Dishwasher	1,200	30
Egg cooker	520	1
Frying Pan	1,200	15
Hot plate	1,260	8
Mixer	130	1
Oven, microwave	1,500	25
Oven, self-cleaning	4,800	95
Range	8,200	97
Roaster	1,340	17
Sandwich grill	1,160	3
Toaster	1,150	3
Trash compactor	400	4
Waffle iron	1,120	2
Waste disposer	450	3
Food Preservation		
Freezer (15 cu. ft.)	340	99
Freezer (frostless, 15 cu. ft.)	440	147
Refrigerator (10 cu. ft.)	240	60
Refrigerator (frostless, 12 cu. ft.)	320	110
Refrigerator/Freezer (14 cu. ft.)	330	94
(frostless, 14. cu. ft.)	620	152
Laundry		
Clothes dryer	4,860	83
Iron (hand)	1,010	12
Washing Machine (automatic)	510	9
Washing machine (nonautomatic)	290	6
Water heater (standard)	2,480	352
Water heater (quick recovery)	4,470	401

Theme 2. Evolution of Energy | Sample Activity 2-3

Electrical Energy Use Chart (cont'd.) | Grade Level 8

	Average wattage	Estimated kilowatt hours monthly
Comfort Conditioning		
Air cleaner	50	18
Air conditioner (room)	1,570	114
Bed covering	180	12
Dehumidifier	260	31
Fan (attic)	370	24
Fan (circulating)	88	4
Fan (rollaway)	170	12
Fan (window)	200	15
Heater (portable)	1,320	15
Heating pad	65	10
Humidifier	180	14
Health & Beauty		
Germicidal lamp	20	12
Hair dryer	380	1
Heat lamp (infrared)	250	1
Sun lamp	280	1
Home Entertainment		
Radio	71	7
Radio/Record player	110	9
Television (b & w)	240	30
Television (color)	330	40
Housewares		
Light bulb	100	15
Clock	2	1
Floor polisher	310	1
Sewing machine	75	1
Vacuum cleaner	630	4

To calculate the number of Kilowatt Hours (kwh) used per month multiply the wattage by the number of hours you expect the appliance to use in 1 month. This will be the number of watt hours. Divide by 1000 to get Kwh.

Electric Coffee Pot used ½ hour per day:

$$\frac{15 \text{ hrs/mo} \times 890 \text{ watts}}{1000} = 13.4 \text{ kwh/mo}$$

THEME 2. Evolution of Energy

Subject Area SS (LA, Sc)
Thematic Area EE, G, LS, VE
Grade Level 9

SAMPLE ACTIVITY 2-4. "In Search of Power"

OBJECTIVE

- To understand the historical development of sources and uses of energy.

CONCEPTS

- History can be interpreted in terms of the discovery, development, and use of energy sources ranging from human power to fossil fuels.
- Energy use evolved from meeting basic needs of primitive cultures to satisfying "wants" of highly industrialized societies.
- Energy conversion technology evolved to make more efficient use of energy sources to perform useful work.
- The development of energy conversion technology affected and was affected by the growth of differing societal, governmental, political, economic, and cultural systems.

ESSENTIAL COMPETENCIES

- EC 1. Read and use printed materials from daily life.
- EC 3. Demonstrate writing skills commonly used in daily life.
- EC 4. Communicate orally in situations common to everyday life.
- EC 8. Reach reasoned solutions to commonly encountered problems.
- EC 10. Use resources for independent learning.

RELATED ENVIRONMENTAL EDUCATION INSTRUCTIONAL GOALS AND/OR OBJECTIVES

- Students will demonstrate an appreciation for the interdependence of living things in the closed earth system. (Goal: pg. D30)
- Students will examine optional courses of action and their consequences for improving the quality of life and will support those that will provide optimum short- and long-term benefits for society and the environment. (Goal: pg. D38)

SOCIAL STUDIES INSTRUCTIONAL OBJECTIVES

- Identify major civilizations and cultures of the western world. (Objective: pg. 31)
- Identify and define the key contributions of the various era of human progress. (Objective: pg. 31)
- Identify and explain the characteristics of today's world as seen through influences from the past. (Objective: pg. 31)
- Identify the common bonds that unify people, despite unique traditions and beliefs that distinguish different cultures from others. (Objective: pg. 31)

Sample Activity 2-4

Grade Level 9

ACTIVITY (Related Core Themes: 1, 3 & 5)

Century after century, people have used their ingenuity and skills to conquer and harness nature's resources to make their work easier. Since the first use of fire to the launchings to the moon, people have used natural resources together with their skills to tap more of nature's secrets.

In this activity, students will trace not only the development of energy use but show where (in what region or country) it originated, the underlying stimulus or cause for the development and the effect the development had on the world.

1. Discuss with students how the luxuries they take for granted came to be. When and where did television have its beginnings? What about the telephone? The automobile?
2. Have them do a time line chart of how people over the ages harnessed energy to do their work. An alternative approach might be to divide the class into groups (by countries or regions) and have them trace the development of energy use for that country or region. Tell them to include, whenever possible, the effects of the new development and/or invention on technological advancements.
3. Have students look at the chart and ask them the following questions:
   a. In what way, is the domestication of animals, such as the horse, similar to the creation of a machine?
   b. Why is the shift from mud to stone houses considered a technological advancement?
   c. During Hitler's time synthetic fuel was being developed. Why? What happened to suppress the development of synthetic fuels?
   d. What inventions or development do you see are on the time-line chart that is now being looked at or re-examined again? Answers may include wind, water, sun, and synthetic fuels.
   e. What inventions and/or developments do you think contributed significantly to our energy dilemma of today?
4. Discuss with students the following questions:
   a. After studying the harnessing of energy resources by the various countries, what makes the highly industrialized countries like the USA unique? Could the other countries become as highly industrialized as the USA? Why haven't they? Would they want to? Has culture and tradition been a factor?
   b. It is now said that many of the so called "have-not" countries are really the "have" countries. Why? It was often said in the past that "necessity is the mother of invention." However, today many feel that "invention is becoming a necessity." Write a paper explaining what you think it means.

Theme 2. Evolution of Energy

Sample Activity 2-4

Grade Level 9

SUGGESTED FOLLOW-UP/ASSESSMENT ACTIVITIES

Jericho, a settlement centered around wheat and water, gave rise to a prosperous civilization envied by other people. Therefore, the city of Jericho built a wall and tower to protect their resources from invading tribes.

Through in-depth research, prove or disprove the following: "Basically, all wars fundamentally are fights over the acquisition, use and control of resources."

THEME 2. Evolution of Energy

Subject Area SS (Art, Bus, LA, Sc)
Thematic Area EE (CE, G, LS, VE)
Grade Level 10

SAMPLE ACTIVITY 2-5. "Play It Again, Sam"

OBJECTIVE

- To understand the historical development of sources and uses of energy.

CONCEPTS

- History can be interpreted in terms of the discovery, development, and use of energy sources ranging from human power to fossil fuels.
- Energy use evolved from meeting basic needs of primitive cultures to satisfying "wants" of highly industrialized societies.
- Energy conversion technology evolved to make more efficient use of energy sources to perform useful work.
- The development of energy conversion technology affected and was affected by the growth of differing societal, governmental, political, economic, and cultural systems.
- Hawaii's history of energy use shows a movement from dependence entirely on local sources of energy to dependence on energy sources outside Hawaii.

ESSENTIAL COMPETENCIES

- EC 1. Read and use printed materials from daily life.
- EC 2. Complete commonly used forms.
- EC 3. Demonstrate writing skills commonly used in daily life.
- EC 4. Communicate orally in situations common to everyday life.
- EC 8. Reach reasoned solutions to commonly encountered problems.
- EC 9. Distinguish fact from opinion in TV and radio news broadcasts, advertising, newspaper and magazine articles, and public speeches.
- EC 10. Use resources for independent learning.
- EC 15. Demonstrate knowledge of important citizen rights and responsibilities.

RELATED ENVIRONMENTAL EDUCATION INSTRUCTIONAL GOALS AND/OR OBJECTIVES

- When faced with decisions concerning the use of earth resources, students will select practices developed in recognition of present and future environmental and human needs. (Goal: pg. D6)
- Students will demonstrate an appreciation for the interdependence of living things in the closed earth system. (Goal: pg. D30)
- Students will examine optional courses of action and their consequences for improving the quality of life and will support those that will provide optimum short- and long-term benefits for society and the environment. (Goal: pg. D38)

Theme 2. Evolution of Energy

Sample Activity 2-5

Grade Level 10

SOCIAL STUDIES INSTRUCTIONAL OBJECTIVES

- Identify and define the historical and cultural backgrounds of the American people. (Objective: pg. 38)
- Identify and explain the distinctive features that characterize the American nation today as seen through influences from the past. (Objective: pg. 38)
- Identify and explain alternative viewpoints, interests, and values of a legal and political issue. (Objective: pg. 44)

SUGGESTED MATERIALS AND/OR RESOURCES

Exercise 2.5.

Theme 2. Evolution of Energy

Sample Activity 2-5

Grade Level 10

ACTIVITY (Related Core Themes: 3)

People have survived by harnessing and using more and more energy throughout the ages. Throughout history, shortages of resources occured, especially during times of wars. Newspaper headlines of various time periods show that history tends to repeat iteself. Similar problem situations occur time after time probably under different situations. What causes these problem situations? How is the citizenry mobilized to meet the problem situation?

In this activity students will study various headlines to see if they can determine when the situation existed. They then will take a look at the situations to see if there are any similarities.

1. Read the following headline to the class and see if they can tell you when it appeared in the newspapers. "Nationwide ration faces drivers." After initial discussion tell them it was a headline found on page 1 of the Honolulu Advertiser on September 26, 1942. Discuss what they think this headline was all about. Some students may mention that it was the war years when everything was scarce. Further discuss if it could be a headline of today or during the oil embargo of 1973-74. Tell students that shortages were faced during various time periods in America's history.
2. Have them do Exercise 2.5.
3. Discuss the questions from Exercise 2.5.
4. Have each student choose one headline and read and summarize the article. When summarizing the article be sure to include the situation of that time period, the causes and effects and possible solutions.

SUGGESTED FOLLOW-UP/ASSESSMENT ACTIVITIES

Do a time line chart of various energy/resource shortage situations throughout America's history starting with the year 1776.

Theme 2. Evolution of Energy — Sample Activity 2-5

Exercise 2.5 (Cont'd.) — Grade Level 10

PART II: Questions for discussion

1. What conclusions can you draw about the headlines you were asked to chart? Were they very similar or dissimilar?
2. Which headlines were easy to chart into the proper time period? Why? Which ones were difficult to do? Why?
3. Were the solutions to the shortage or scarcity situation for each period the same? Explain.
4. In what ways are the problem situations for each time period alike? Different?
5. What does the title of this activity imply?
6. Write one sentence which would best describe the energy situation for each time period?

Theme 2. Evolution of Energy

Sample Activity 2-5

Exercise 2.5

Grade Level 10

"Play It Again, Sam"

PART I: Ordering and Sequencing

Directions:

1. Place the following headlines into the following three groups:
   - A) War Years (1939-1943)
   - B) Oil Embargo (1973-74)
   - C) 1976-Present

   (There should be 5 headlines per group)
2. If possible, list the 5 headlines in each group in their proper sequence from least to most current:

"Limited sale hours sought for gasoline"
"Mideast crisis causes shortage"
"Washington to cut Hawaii food supply"
"14% of Hawaii's energy could be homegrown organic materials, biomass"
"Ilikai to use kukui oil lights, candles for outdoor Christmas display"
"Isles eyed for test of future fuel, hydrogen extracted from water"
"Farmers save gas, pool trucks"
"Mandatory Gas plan ends"
"Ration starts Monday for all cars"
"Householders' aid asked in scrap drive"
"Shortage a thing of the past"
"Basic ration to be 10 gallons"
"Use of garbage as fuel urged"
"GASPLAN helps out lines"
"City Council briefed on use of trash in energy conversion plant: possibilities and alternatives"

News Item	War Years (1939-1943)	Oil Embargo (1973-74)	Post Oil Embargo of '73 (1976-Present)
1			
2			
3			
4			
5			

Theme 2. Evolution of Energy — Sample Activity 2-5

Exercise 2.5 - Teacher's Answer Sheet — Grade Level 10

Answers to Exercise 2.5 - PART I

A. World War II Years (1939-1943)

"Ration starts Monday for all cars"	Advertiser 12/13/41 pg. 1
"Farmers save gas, pool trucks"	Advertiser 3/10/42 pg. 2
"Basic ration to be 10 gallons"	Star Bulletin 6/08/42 pg. 1
"Householders' aid asked in scrap drive"	Advertiser 9/25/42 pg. 1
"Washington to cut Hawaii food supply"	Advertiser 10/17/45 pg. 1

B. Oil Embargo of 1973-'74

"Mideast crisis causes shortage"	Advertiser 11/01/73 pg. A1:1
"Ilikai to use kukui oil lights, candles for outdoor Christmas display"	Advertiser 11/21/73 pg. A5:4
"GASPLAN helps out lines"	Star Bulletin 2/23/74 pg. A8:1
"Mandatory Gas plan ends"	Advertiser 05/01/74 pg. A1:1 Star Bulletin 05/01/74 pg. A3:2
"Shortage a thing of the past"	Star Bulletin 8/03/74 pg. A2:1

C. 1976-Present

"14% of Hawaii's energy could be homegrown organic materials, biomass"	Advertiser 03/14/77 pg. A-6
"Use of garbage as fuel urged"	Star Bulletin 5/05/77 pg. A6
"Limited sale hours sought for gasoline"	Advertiser 7/03/77 pg. A1 Star Bulletin 7/03/77 pg. A1
"City Council briefed on use of trash in energy conversion plant: possibilities and alternatives"	Star Bulletin 7/09/77 pg. A7
"Isles eyed for test of future fuel, hydrogen extracted from water"	Star Bulletin 9/28/77 pg. D-6

THEME 3. ENERGY TODAY

BACKGROUND

In theme 3, students examine and evaluate the current sources and uses of energy for the purpose of understanding how deeply the use of energy permeates their daily lives. They also investigate the ways in which modern technological society uses energy to support the conveniences of home, transportation, industry and commerce. The energy used by modern societies amounts to more than 100 times as much as primitive cultures used in the past.

While keeping the increasing demand for energy in mind, students become aware that energy resources are becoming scarce and costly. They also become aware of the need for wise and efficient use of energy sources.

FOUNDATION PROGRAM OBJECTIVES

FPO 1. Develop basic skills for learning and effective communication with others.
FPO 2. Develop self-concept.
FPO 3. Develop decision-making and problem-solving skills at the student's proficiency level.
FPO 4. Develop independence in learning.
FPO 6. Recognize and pursue career development as an integral part of growth and development.

CORE THEME OBJECTIVE

To know current sources and uses of energy.

CONCEPTS

1. The available energy sources fall into two basic categories: renewable and non-renewable.
2. The major energy sources we use today are fossil fuels which are limited and non-renewable.
3. The major uses of energy are industrial, transportational, residential, and commercial.
4. The availability of energy sources affects and is affected by technology and by political, social, economic and cultural systems.
5. Hawaii imports almost all of its materials and energy sources from outside the state.

THEME 3. Energy Today

RELATED GOALS AND/OR GENERAL OBJECTIVES OF SUBJECT AREA GUIDES

AGRICULTURE: (pg. 58 - Unit VI) Efficient processing, marketing, and distribution are essential in making agricultural products economically available to people.

ART: (pg. 7 - Objective) Make and justify judgments about works of art and the selection of art products used in daily living.

ASIAN, EUROPEAN AND PACIFIC LANGUAGES: (pg. 7 - Goal) An understanding of the geographic influences upon the economic and social development of the country.

BASIC PRACTICAL ARTS: (pg. 4 - Objective) To effectively utilize the resources of our technological world and to understand the importance of conservation.

BUSINESS EDUCATION: (pg. V - Objective) To live effectively in today's economic environment.

HEALTH: (pg. 1 - Goal) Through a developmental health education program, students will acquire accurate health information, and gain experience contributing to attitudes, values and responsible health practices; students will be able to make decisions relating to their health and understand how these decisions affect them and the society in which they live.

HOME ECONOMICS: (pg. iii - Objective) Make and carry out intelligent decisions regarding the use of personal, family, and community resources.

INDUSTRIAL ARTS/INDUS-TECH: (pg. 2 - Objective) Develop an understanding of the nature and significance of materials, tools, processes, products and occupations of our technological world, and their impact upon our society.

LANGUAGE ARTS: (pg. 4 - Goal) To assist students to develop the highest degree of informed control of which they are capable over their use of language.

MATHEMATICS: (pg. 13 - Goal) Develop mathematical competencies to function effectively in today's society.

MUSIC: (pg. 2 - Objective) Use musical skills in communicating ideas, thoughts and feelings.

PHYSICAL EDUCATION: (pg. 106 - Objective) Acquire the habit of participating in wholesome recreational activities.

SCIENCE: (pg. A-13 - Objectives) 1. Facilitate the students' ability to use scientific knowledge, processes, instruments and scientific language to clarify values, examine issues, solve problems in fulfilling personal, social and career life roles. 2. Foster the intellectual virtues that are characteristics of science inventiveness, self-direction, and rationality. 3. Help students to analyze and synthesize holistically (using knowledge from various disciplines) in solving a problem.

SOCIAL STUDIES: (pg. 11 - Objectives) 1. The student is able to select and use appropriate criteria, procedures, and information sources to assess the validity or significance of findings about past, present, or future human life or affairs. 2. The student is able to identify and analyze problems and issues by which he or she is affected as a member of a changing multicultural society.

THEME 3. Energy Today

Subject Area SS

Grade Level 7-12

THINGS TO DO (Grade 7)

1. Make a list of ancient customs that exist today. Are any of the customs energy intensive? Should these customs be preserved even if they are energy intensive? What are the present costs/benefits of some of our ancient customs (e.g. burning of firecrackers, leaving food at the gravesite, etc.)?

2. Investigate Hawaii's energy consumption and production rates for this past year. Make a pie chart showing energy use by various sectors. Why must Hawaii import so much foreign oil? List some geological and geographical factors that account for our need to import. Are there other factors? If so, what are they? Why can't we import all of our oil from continental U.S.A.?

3. Compare Hawaii's energy consumption patterns to continental U.S.A. Are they similar? Why or why not? What major local factors affect our energy consumption patterns?

4. Conduct a survey and find out how energy costs have affected our pineapple and sugar industries. Has it affected tourism? Explain. Support your answers with data from the State Energy Office.

THINGS TO DO (Grade 8)

*1. Find out where fossil fuels are located in our world. What products are made from fossil fuels? (See Sample Activity 3-1. "Fueling Around")

2. Collect newspaper clippings about the energy dilemma. Write your opinions about the articles and post them on the bulletin board. Do you agree with the writers? Why or why not? Discuss your feelings with your teachers and fellow classmates.

3. Stage a debate or a panel discussion on whether the energy crisis is real or fabricated. Have charts and statistical information to support your stance.

4. Make a collage showing how energy is very basic to life; i.e., all living things and natural processes require energy.

5. As our fossil fuel sources become scarce, jobs may be created and/or eliminated. What industries might be adversely affected? Positively affected?

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*For detailed description, refer to noted Sample Activity.

THINGS TO DO (Grade 9)

*1. What does OPEC stand for? Who is OPEC? How does OPEC affect oil prices? (See Sample Activity 3-2. "OPEC: Our Present Energy Condition").

2. Bring in at least 2 articles from current newspapers or magazines which show the relationships between energy, ecology, and economics. Are these relationships international, national, or local in scope? Topics might include environmental and cost factors in mining of coal or offshore oil drilling; protection standards for energy producing industries, etc. For each article explain the relationships and the scope of international, national or local involvement.

3. Identify through reading and map construction where various types of fossil fuels are located throughout the world. Use this information to study world trade, alliances, and conflicts among nations. Design and construct a simulation game showing the relationships that may develop among nations.

4. Find out where the world's known oil reserves are located. What are the similarities and differences of these regions? How much oil is left in these regions? At current estimates, how long will they last? (See Two Energy Gulfs, Interdisciplinary Student/Teacher Materials in Energy, the Environment, and the Economy (EEE), Department of Energy, March 1979.)

5. Compare the energy production and consumption patterns of two regions such as Ghana and the Washington, D.C. area of United States. What are the sources of energy used in Ghana? Washington, D.C.? Does lifestyle and/or culture determine the amount of energy produced and/or consumed? (See Bringing Energy to the People: Washington, D.C. and Ghana, Interdisciplinary Student/Teacher Materials in Energy, the Environment, and the Economy (EEE), February, 1978.)

THINGS TO DO (Grade 10)

1. Research and find out the locations of coal deposits in the United States. What are the advantages of Western coal over coal in the East? Locate coal deposits that are currently unexploited. What is the future for such coal? Is coal an energy alternative? (See Western Coal: Boom or Bust? Interdisciplinary Student/Teacher Materials in Energy, the Environment, and the Economy (EEE), June 1979.)

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*For detailed description, see noted Sample Activity.

THINGS TO DO (Grade 10) (Cont'd.)

2. Make a booklet of newspaper clippings that concerns the energy crisis. Write a short paragraph discussing the implications and/or ramifications of each article. Share your booklet with other members of your class.

3. Clip out controversial cartoons from the newspaper. (Controversial cartoons can usually be found on the editorial pages.) Remove the captions if there are any, and write one of our own. Does the message of the cartoon affect you personally? Explain.

THINGS TO DO (Grade 11)

*1. Study the relationship between news coverage and energy consumption. When energy permeates our news media, do people cut down their rate of energy consumption? (See Sample Activity 3-3. "A Matter of Concern")

2. Collect articles from your local newspaper and paste them in a booklet in chronological order. Assess the series of articles for discrepancies and trends. Make a graph(s) to show trends.

3. Bring in at least 3 articles from the local newspaper covering some aspect of the relationship between energy, ecology and economics. Topics may incude alternate energy source; use of coal by Kaiser Cement, measures designed for energy conservation with little or no interruption of businesses, etc. For each article, explain the relationships.

Note: Suggested activities could also be used by students taking related electives in grades 11 and 12.

VOCABULARY

Alternatives, cartel, consumption, customs, ecology, economy, fossil fuel, lifestyles, non-renewable, nuclear, OPEC, pollution, price de-control, reserves, scarcity, standard of living, windfall profit tax.

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*For detailed description, refer to noted Sample Activity.

THEME 3. Energy Today

Subject Area SS (LA, M, Sc)
Thematic Area EE, G, LS, VE
Grade Level 8

SAMPLE ACTIVITY 3-1. "Fueling Around"

OBJECTIVE

- To know current sources and uses of energy.

CONCEPTS

- The available energy sources fall into two basic categories: renewable and non-renewable.
- The major energy sources we use today are fossil fuels which are limited and non-renewable.
- The major uses of energy are industrial, transportational, residential, and commercial.

ESSENTIAL COMPETENCIES

- EC 1. Read and use printed materials from daily life.
- EC 3. Demonstrate writing skills commonly used in daily life.
- EC 4. Communicate orally in situations common to everyday life.
- EC 6. Read and use scales on standard measuring devices.
- EC 7. Interpret common visual symbols.
- EC 10. Use resources for independent learning.
- EC 15. Demonstrate knowledge of important citizen rights and responsibilities.

RELATED ENVIRONMENTAL EDUCATION INSTRUCTIONAL GOALS AND/OR OBJECTIVES

- Students will support and practice wise utilization of traditional sources of energy and also support research and development of alternate energy sources. (Goal: pg. D2)
- When faced with decisions concerning the use of earth resources, students will select practices developed in recognition of present and future environmental and human needs. (Goal: pg. D6)

SOCIAL STUDIES INSTRUCTIONAL OBJECTIVES

- Identify the major economic and consumer problems confronting American society today, describe and explain some probable causes and the effects on the nation and its people. (Objective: pg. 28)
- Identify significant personal problems confronting oneself today and possibly in the future, describe and explain some probable causes and effects on the individual presently and in the future. (Objective: pg. 28)

Theme 3. Energy Today

Sample Activity 3-1

Grade Level 8

SUGGESTED MATERIALS AND/OR RESOURCES

1. Old magazines.
2. Two Energy Gulfs, EEE Materials, prepared for U. S. Department of Energy by NSTA, 1979.

Theme 3. Energy Today

Sample Activity 3-1

Grade Level 8

ACTIVITY (Related Core Themes: 1, 2, 4 & 5)

Most of the energy we use comes from fossil fuel stored in the earth. Fossil fuels are really plants that grew millions of years ago. The plants grew because of the sun's energy. We could say that fossil fuel is really another form of solar energy.

Where are all of these fossil fuels located? Here in Hawaii there are no fossil fuels because it takes millions of years before they are formed. Many fossil fuel deposits are located in the United States as well as other countries of the world.

Today fossil fuels are used everyday in our lives. Many of the products we take for granted are derivative products of fossil fuels. Some of these products are plexiglas, wax, plastic wraps, cellophane, synthetic rubber, vinyl, teflon, etc. Is it possible to go through one day without coming in contact with any fossil fuel derivative product?

In this activity, students will familiarize themselves with where fossil fuel deposits are located and from whom we import our fuels. Students will also become more aware of the derivative products from fossil fuels and be able to understand and describe the impact of diminishing energy supplies on these products.

1. Have students draw an outline map of the world. Using their own legends or symbols have them show the location and relative amounts of fossil fuel deposits in the United States. Ask them to differentiate with their legends, the various types of fossil fuel such as coal and oil. If they wish, they may illustrate their findings graphically as well. How does the United States rank in world production of coal? Oil? How does the United States compare against the world leader in the production of coal? Oil? What is the difference in tonnage of coal and barrels of oil between the highest producer and lowest producer? Does the United States import coal? Oil? Does the U. S. have to? Explain. What about Hawaii? Where do we get our oil from? Do we also import coal? Why or why not? (See EEE Materials, Two Energy Gulfs (1979), (1975), both prepared by NSTA for the U. S. Department of Energy.)
2. Discuss with students how energy (fossil fuels) permeates their daily lives. Tell students to collect samples or pictures of derivatives of crude oil and coal for classroom display. Have them make a bulletin board display. Ask them if they would be willing to give up any of the products. If possible get samples of crude oil and coal from your local Standard Oil Company for students to see. Some crude oil products are: Kerosene, gasoline, plastics, wax, synthetics, etc. Some coal products are: Lead pencils, paint, perfume, synthetic rubber, cosmetics, etc. (A more thorough list can be found on pages 72 and 73.

ACTIVITY (Cont'd.)

3. Have students read a newspaper or magazine article or any other article or story and circle the items mentioned that are fossil fuel derivative products. (For a sample, see Energy Use and the Environment Science Module, Activity 4-2.) As a variation, you could assign students to read a short story of life in the year 1900 and a short story of life today. Compare the number of items circled in one story as compared to the other. This variation exercise will show how energy intensive we have become.
4. Have students investigate and find out who the energy users are. Have them make a two-pie chart to show the percentage of coal and petroleum used by various sectors of the community.
5. Have students read newspapers, view television programs, etc., and write an essay on the impact of dwindling energy resources on their lives. Tell them to be specific. At the end of the assignment have them share their essay with the class.

SUGGESTED FOLLOW-UP/ASSESSMENT ACTIVITIES

1. Draw or write a report explaining how various fossil fuels are converted to a marketable product.
2. Draw two "Energy Trees" showing 1) petroleum and some of its products today and 2) petroleum and its products of 60 years ago.

Theme 3. Energy Today

Sample Activity 3-1
Grade Level 8

SOME COAL-BASED PRODUCTS[1]

- Carbolic acid
  - Pharmaceuticals
- Cresols
  - Lysol
  - Photo developer
  - Plastics
- Phenols
  - Detergents
  - Drugs
  - Dyes
  - Food perservatives
  - Perfumes
  - Rubber chemicals
  - Weedkiller
- Pyridine bases
  - Antiseptics
  - Disinfectants
  - Paint thinner
- Pyridine
  - Clothes waterproofing
  - Sulfa drugs
  - Synthetic vitamins
- Naphthalene
  - Insecticides
  - Fungicides
  - Plastic dolls
  - Explosives
  - Moth balls
  - Synthetic fibers
- Heavy oil
  - Dyes
  - Embalming fluid
  - Laxatives
  - Wood preservatives
- Pitch
  - Electrodes
  - Insulation
  - Paving
  - Roofing
  - Storage batteries
  - Waterproofing
- Benzene
  - Synthetic fibers
    - Nylon
  - Aniline dyes
  - Food perservatives
  - Motor fuel
  - Plastics
  - Synthetic rubber
  - Tanning fluids
- Toluene
  - Antiseptics
  - Fingernail polish
  - Printing ink
  - Saccharin
  - TNT explosive
  - Aviation gasoline
  - Detergents
- Xylene
  - Motor fuel
  - Gasoline solvents
  - Herbicides
- Solvent Naphtha
  - Rubber solvent
  - Electrical insulation
  - Linoleum
  - Varnish
- Ammonium sulfate
  - Fertilizers
  - Chemicals
- Ammonia liquor
  - Fertilizers
  - Explosives
  - Household ammonia
  - Refrigerant
  - Nitric acid
- Diammonium phosphate
  - Fertilizer
  - Fire retardant
- Sulfur
  - Fungicides
  - Insecticides
  - Sulfuric acid
- Cyanogen
  - Cotton finishing
  - Dyes

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[1] Data compiled from many sources.

Theme 3. Energy Today

Sample Activity 3-1

Grade Level 8

SOME OIL-BASED PRODUCTS[1]

Antenna cable
Credit cards
Permanent-press clothes
Heart valves
Crayons
Disposable diapers
Parachutes
Telephones
Enamel
Transparent tape
Vinyl siding
Safety flares
Bubble bath
Bookends
Deodorant
Panty hose
Bedspreads
Plastic tubs
Shag rugs
Lunch boxes
Jerseys
Windshield wipers
Phonographs
Car sound insulation
Garment bags
Fences
Kitchen counter tops
Pillows
Dune buggy bodies
Checkers
Soap dishes
Syringes
Draperies
Knitting yarn
Notebooks
Hang gliders
Lamp shades
Eyeglasses
Water softeners
Dishwashing liquid
Badminton birdies
Visors
Ammonia
Digital clocks
Fishing net
Shoes
Volley balls
Sleeping bags
Electrician's tape
Mascara
Flags
Oxygen masks
Ink
Hair spray
Steering wheels
Food wraps
Rubber duckies
Seed tape
Card tables
Ping pong paddles
Purses
Weed killers
Football pads
Puzzles
Carbon paper
Dishdrainers
Puppets
Upholstery
Hearing aids
Earphones
Whistles
Clothesline
Carpet sweepers
Chess boards
Yardsticks
Slip covers
Patio screens
Car battery cases
Sandwich bags
Darts
Sandals
Skateboard wheels
Vinyl tops
Microfilm
Extension cords
Bird feeders
Tennis rackets
Gaskets
Life jackets
Hair coloring
Mats
Refrigerator linings
Floor wax
Panelling
Earrings
False eyelashes
No-wax floors
Golf balls
Lighter fluid
Attache cases
Wet suits
Laxatives
Trash cans
Brassieres
Acrylic paints
Vacuum bottles
Bearing grease
Rafts
Sockets
Tiles
Air-conditioners
Wallets
Backpacks
Rubbing alcohol
Epoxy glue
Oil filters
Mailboxes
Uniforms
Pacifers
Cassette tapes
Luggage
Antifreeze
Hockey pucks
Tablecloths
Flea collars
Lipstick
Guitar strings
TV cabinets
Tennis balls
Combs
Hair curlers
Canisters
Monkey bars
Model planes
Rubber cement
Flashlights
Motorcycle helmets
Antibiotics
Shower doors
Sugar bowls
Decoys
Tobacco pouches
Pencils
Model cars
Garden hoses
Lawn sprinklers
Playing cards
Dolls
Bubble gum
Coasters
Straps
Tires
Rulers
Boat covers
Unbreakable dishes
Tooth paste
Tents
Finger paints
Glycerin
Foot pads
Lamps
Ice cube trays
Swimming pool liners
Cough syrup
Hair dryers
Styrofoam coolers
Brake fluid
Fertilizers
Toothbrushes
Stadium cushions
Electric blankets
Jugs
Measuring tape
Measuring cups
Plastic varnish
Laminates
Computer tape
Venetian blinds
Insect repellent

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[1] Data compiled from many sources.

Subject Area SS (Art, LA)
Thematic Area EE, G, LS, VE
Grade Level 9

SAMPLE ACTIVITY 3-2. "OPEC: Our Present Energy Condition"[1]

OBJECTIVE

- To know current sources and uses of energy.

CONCEPTS

- The available energy sources fall into two basic categories: renewable and non-renewable.
- The major energy sources we use today are fossil fuels which are limited and non-renewable.
- The availability of energy sources affects and is affected by technology and by political, social, economic and cultural systems.

ESSENTIAL COMPETENCIES

- EC 1. Read and use printed materials from daily life.
- EC 3. Demonstrate writing skills commonly used in daily life.
- EC 4. Communicate orally in situations common to everyday life.
- EC 7. Interpret common visual symbols.
- EC 8. Reach reasoned solutions to commonly encountered problems.
- EC 15. Demonstrate knowledge of important citizen rights and responsibilities.

RELATED ENVIRONMENTAL EDUCATION INSTRUCTIONAL GOALS AND/OR OBJECTIVES

- Students will support and practice wise utilization of traditional sources of energy and also support research and development of alternate energy sources. (Goal: pg. D2)
- Students will demonstrate an appreciation for the interdependence of living things in the closed earth system. (Goal: pg. D30)
- Students will examine optional courses of action and their consequences for improving the quality of life and will support those that will provide optimum short- and long-term benefits for society and the environment. (Goal: pg. D38)

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[1] Adapted from: "Energy and the Environment in Social Studies Education: An Isosceles Curriculum," by Barry W. Jamason, Social Education, Vol. 44, No. 4, April 1980, pg. 280.

Theme 3. Energy Today

Sample Activity 3-2

Grade Level 9

SOCIAL STUDIES INSTRUCTIONAL OBJECTIVES

- Identify major economic, social and political systems that have evolved in different civilizations and cultures throughout the world. (Objective: pg. 31)
- Identify major philosophies, religions, and value systems that have influenced the lifestyle of different civilizations and cultures. (Objective: pg. 31)
- Identify the characteristics and explain the causes of conflict among human beings and cultures and possible ways of analyzing and/or resolving them. (Objective: pg. 31)
- Identify and explain the characteristics of today's world as seen through influences from the past. (Objective: pg. 31)
- Define social change and explain how it has affected and influenced the lifestyle of people in various cultures. (Objective: pg. 31)
- Identify the common bonds that unify people, despite unique traditions and beliefs that distinguish different cultures from others. (Objective: pg. 31)

SUGGESTED MATERIALS AND/OR RESOURCES

Copy of cartoon for each student.

Sample Activity 3-2

Grade Level 9

ACTIVITY (Related Core Themes: 4, 5, 10, 12, 13 & 15)

The earth's natural resources are unequally distributed with respect to land areas and political boundaries. Thus the unequal spatial distribution of energy resources creates conflicts over priorities in the production, use, management and conservation of these resources.

The lifestyle and level of living of a society or culture determine to a large degree the production, management and use of energy resources.

Because of our dwindling fossil fuel resources and the uncertainty and instability of foreign oil imports, the development of alternate sources of energies for existing non-renewable sources coupled with a change in our prevalent lifestyles and a shift in priorities is needed.

In this activity, students will get a chance to examine our present energy situation and the role OPEC plays.

1. Discuss with the class the formation of the oil cartel by the oil-producing nations.
2. Have them read "Countering the Oil Cartel," (Time, November 11, 1974, pg. 36).
3. Discuss the reading with the class and ask the following questions:
    a. What does the acronym "OPEC" stand for? Who are the members of OPEC?
    b. What effect does the cartel have on crude oil prices? How will it affect us as individuals?
    c. The Arab nations were often referred to as "have-nots." Is it still appropriate to label them as "have-nots" today? How has the current oil demand/supply situation aided in the shift in labeling from "have-nots" to "haves" for the Arab nations?
4. Have the class research and develop a chronological time line from 1974 to present, showing the actions taken by OPEC. How have their actions affected petroleum imports, fuel prices, and the economic conditions in the Western nations.
5. Give students copies of Exercise 3.2 and have them analyze the cartoon's significance in our present energy condition.

SUGGESTED FOLLOW-UP/ASSESSMENT ACTIVITIES

1. Draw your own cartoon depicting our present energy situation using no captions. Exchange it with a classmate and write a caption for your classmate's cartoon.
2. Submit your cartoon to a local or school newspaper.
3. Write a script for a one-act circus show based on the cartoon. Act it out for the class. Be sure your skit projects the feelings of the animals and what they might do to find relief.

Theme 3. Energy Today

Exercise 3.2

Sample Activity 3-2

Grade Level 9

"OPEC: Our Present Energy Condition"

Directions: Examine the cartoon on page 78 closely. Based on your examination, answer the questions below.

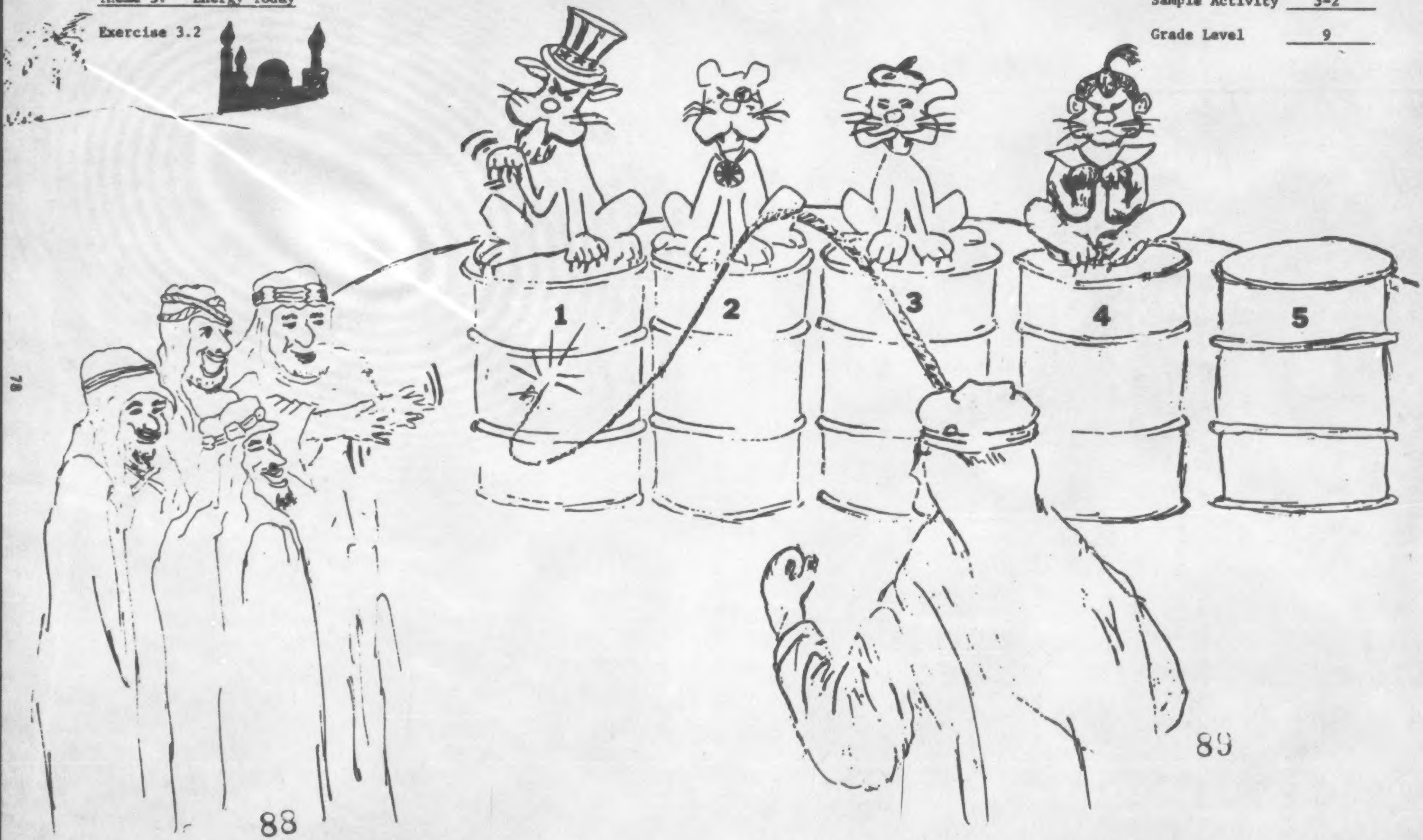
1. What or who do the animals represent?
2. What is the nationality of the trainer?
3. Where is the "circus show" being performed?
4. Who are the people in the audience?
5. Who is controlling the animals actions?
6. What is the mood of the audience?
7. Would the show be a hit in America? Western Europe? Japan? Why or why not?
8. Would the cartoon have the same meaning if the animals were not in costumes? Why or why not?
9. How is the trainer able to manipulate or control his animals? How did he acquire this power?
10. What is the trainer really trying to show his audience? Do you think he is successful at doing that?
11. What is the animal on barrel number 1 trying to do? How about barrel 2? Barrel 3? Barrel 4?
12. What does the barrel without any animal mean?
13. How is the cartoon indicative of what really is happening to our political and economic relationships among the countries depicted?

Theme 3. Energy Today

Exercise 3.2

Sample Activity 3-2

Grade Level 9



THEME 3. Energy Today

Subject Area SS (LA, M, Sc)
Thematic Area EE, G, LS, VE
Grade Level 11

SAMPLE ACTIVITY 3-3. "A Matter of Concern"

OBJECTIVE

- To know current sources and uses of energy.

CONCEPTS

- The available energy sources fall into two basic categories: renewable and non-renewable.
- The major uses of energy are industrial, transportational, residential, and commercial.
- The availability of energy sources affects and is affected by technology and by political, social, economic and cultural systems.

ESSENTIAL COMPETENCIES

- EC 1. Read and use printed materials from daily life.
- EC 4. Communicate orally in situations common to everyday life.
- EC 5. Use computational skills in situations common to everyday life.
- EC 6. Read and use scales on standard measuring devices.
- EC 8. Reach reasoned solutions to commonly encountered problems.
- EC 10. Use resources for independent learning.
- EC 15. Demonstrate knowledge of important citizen rights and responsiblities.

RELATED ENVIRONMENTAL EDUCATION INSTRUCTIONAL GOALS AND/OR OBJECTIVES

- Students will demonstrate an appreciation for the interdependence of living things in the closed earth system. (Goal: pg. D30)
- Students will examine optional courses of action and their consequences for improving the quality of life and will support those that will provide optimum short- and long-term benefits for society and the environment. (Goal: pg. D38)

SOCIAL STUDIES INSTRUCTIONAL OBJECTIVES

- Identify and explain the significant social, political and economic issues currently facing Hawaii's people. (Objective: pg. 47)

SUGGESTED MATERIALS AND/OR RESOURCES

1. Metric ruler, graph paper.
2. All issues of a magazine dating from 1965 to present.

Sample Activity 3-3

Grade Level 11

ACTIVITY (Related Core Themes: All)

The energy joyride is abruptly coming to a halt. In the past it seemed that energy resources were inexhaustible. Exactly when did the concern for our dwindling energy resource surface? Was it during the oil embargo of 1973? A clue to the beginnings of our concern about energy resource may lie in the amount of news coverage of energy topics.

In this activity students will see if there is a relationship between news coverage and energy consumption or conservation. Students can determine coverage by counting the number of articles dealing with the topic or by measuring the total amount of space devoted to it.

1. Discuss with students the energy related stories in the newspaper and/or magazines. Ask them if they feel energy is permeating the news more and more today. Ask them to predict when (what year) they feel energy became a major concern here in the United States.
2. Tell them that as a class, they will find out when concern for our dwindling resources began.
3. Ask the librarian for issues of magazines dating back to 1965 or earlier. Try to obtain all the issues for the years 1965, 1970, 1974 and 1978 and present year. (If all of the issues are not available, choose sample years from whatever is available.)
4. Divide the class into groups and have each group examine several issues of the magazine.
5. Tell students to count both the number of articles relating to energy and the amount of space devoted to it (measured in square centimeters) for each issue. As a class, determine what kinds of articles will be counted (e.g. articles concerning utility bills, gasoline, alternate energy sources, nuclear power, etc.). If any group is in doubt, have the class decide whether the given article should be counted or not.
6. Have the class construct a bar graph to show the total amount of square centimeters of news coverage for each month in each year. Have them make another graph to show the total number of articles for each month in each year.
7. On a third graph, show the total energy consumed in kilowatt hours (or BTU's) for each month or year. (Information concerning energy use can be obtained from the State Energy Office.)
8. Discuss and analyze the results by asking the following questions:
   a. Looking at the news coverage graphs, were there any months that shared spurts of coverage? What could some of the reasons be? For example, was it an election year? Were there any unusual events surrounding that time period?

ACTIVITY (Cont'd.)

b. Do the news coverage graphs show any trends? If the trend is a gradual increase over time, what does this suggest? Make up as many reasons as seem reasonable to explain fluctuations in the graph.
c. What happened to news coverage of energy topics during the oil embargo of 1973? Immediately after the oil embargo was there continued increasing concern about energy? Why or why not?
d. Was there a significant change in energy consumption in any year? If so, what explanation could you give? What is the relationship, if any, between news coverage and energy consumption?
e. Are the results of this survey as predicted? Why or why not? Does the media reflect only public concern, or does it also stimulate it?

SUGGESTED FOLLOW-UP/ASSESSMENT ACTIVITIES

Look at the focus of coverage for various years and see how it has changed. To do this, make a chart to help categorize the articles as you survey each magazine issue.

THEME 4. CONSERVATION

BACKGROUND

Theme 4 considers energy conservation practices as a way of helping to deal with the problem of increasing demands and decreasing supplies of energy resources. Energy is becoming scarcer and costlier as a result of fossil fuel supplies not meeting the present demands. This is a problem which touches the lives of all people.

As a result of energy conservation, the economic and environmental costs of energy may be reduced and time to research alternative energy sources may be increased. Energy conservation and the use of different energy alternatives may also reduce dependence on outside sources and increase the availability of scarce energy resources for use by developing nations and future generations.

Since the manner in which young people are oriented to energy use is an important determinant of the level of energy use within their society, it is of utmost importance that students are taught to value and practice a conservation ethic. Understanding this will help students in making everyday decisions to use energy more efficiently and with less waste. They should also be encouraged to formulate and follow their own plans of action to meet the energy, economic and environmental challenges presented by fossil fuel shortages. Informed students who are willing and able to act responsibly can contribute to the solution of energy related problems.

FOUNDATION PROGRAM OBJECTIVES

FPO 1. Develop basic skills for learning and effective communication with others.
FPO 2. Develop positive self-concept.
FPO 3. Develop decision-making and problem-solving skills at the student's proficiency level.
FPO 7. Develop a continually growing philosophy such that the student is responsible to self as well as to others.
FPO 8. Develop creative potential and aesthetic sensitivity.

CORE THEME OBJECTIVE

To formulate and practice a conservation ethic in regard to energy use and the environment.

Theme 4. Conservation

CONCEPTS

1. The earth's resources are limited.
2. Energy conservation is the wise and efficient use of energy.
3. Conservation of fossil fuels will allow more time to identify new energy sources and to develop appropriate energy conversion systems.
4. Energy conservation will affect and be affected by present and future life styles and cultural conditions.
5. Political and cultural interest groups influence the decisions made regarding the development, use, and conservation of particular energy sources.
6. Energy conservation and the use of different energy alternatives in Hawaii will reduce dependency on imported energy sources and increase energy self-sufficiency.

Theme 4. Conservation

RELATED GOALS AND/OR GENERAL OBJECTIVES OF SUBJECT AREA GUIDES

AGRICULTURE: (pg. 59 - Unit VII) Agriculture is faced with environmental problems that are both internal and external.

ART: (pg. 7 - Objective) Communicate ideas, thoughts, and feelings through various modes of self-expression in a unique and creative way.

ASIAN, EUROPEAN AND PACIFIC LANGUAGES: (pg. 7 - Goal) A knowledge and understanding of the customs and mores of society reflected in the student's behavior when living among the foreign group.

BASIC PRACTICAL ARTS: (pg. 4 - Objectives) 1. To effectively utilize the resources of our technological world and to understand the importance of conservation. 2. To develop an awareness of the needs of society for goods and services and how goods and services are effectively provided.

BUSINESS EDUCATION: (pg. V - Objective) To live effectively in today's economic environment.

HEALTH: (pg. iii & 1 - Goal) Through a developmental health education program, students will acquire accurate health information, and gain experience contributing to attitudes, values and responsible health practices; students will be able to make decisions relating to their health and understand how these decisions affect them and the society in which they live.

HOME ECONOMICS: (pg. iii - Objective) Purchase consumer goods and services appropriate to an overall consumption plan and wise use of economic resources.

INDUSTRIAL ARTS/INDUS-TECH: (pg. 2 - Objective) Apply technical knowledge and techniques for effective living in situations such as recreation, consumption, occupation, and education.

LANGUAGE ARTS: (pg. 4 - Goal) To assist students to develop the highest degree of informed control of which they are capable over their use of language.

MATHEMATICS: (pg. 13 - Goal) Develop ability to think critically and to solve problems.

MUSIC: (pg. 2 - Objective) Use musical skills in communicating ideas, thoughts and feelings.

PHYSICAL EDUCATION: (pg. 106 - Objective) Move skillfully and know the concepts relevant to all physical movement.

SCIENCE: (pg. A-13 & 14 - Objectives) 1. Foster the students' appreciation for the practical and aesthetic contribution of science to the improvement of quality of life and to promote in our students the desire to take an active part in that contribution. 2. Prepare the children for useful effective citizenship in and a curiosity about the future both for themselves and for the civilization of which they are a part. 3. Help students gain experience with the potentialities and limitations of the methods of scientific and social investigation but at the same time recognize that the environment can be interpreted and manipulated.

SOCIAL STUDIES: (pg. 11 - Objectives) 1. The student is able to clarify value conflicts of communication problems which affect choices, decisions, or relationships. 2. The student is able to construct, evaluate, and revise alternatives for personal goals, plans, or problem solutions, considering costs and benefits to self and to others affected by his or her decisions.

THINGS TO DO (Grade 7)

*1. Study the conservation practices of ancient Hawaiians. Why is the old Hawaiian fishpond considered a conservation measure? (See Sample Activity 4-1. "The Pond Broker")

2. Interview people and find out what they are doing about conservation. Share your findings with fellow classmates. As a class decide which measure suggested by people saves the most fossil fuel energy, is practical and feasible. Which conservation measure seems to be practiced most often? Why?

3. Conduct an energy audit at home and find out how you can conserve energy. Practice these conservation measures for a month and see if you did save energy. How can you find out if you did save energy?

4. Study the various culture groups in Hawaii and find out if any of their eating or food preparation habits are energy conserving. Explain in what way. Are any of their native dresses (clothing) energy conserving? Have cultural eating or food preparation habits remained essentially the same? What about native dress? Why or why not?

5. Discuss how the kahunas (i.e., master craftsmen) influenced conservation practices. Give specific examples.

6. Find out how the ancient Hawaiians practiced conservation. Were the methods effective? Why did they feel the need for conservation? Are any of their conservation measures being practiced today? If so, what are they? If not, why not? Have the earlier methods and reasons for conservation changed over the years? Explain.

THINGS TO DO (Grade 8)

1. Make a list of changes people can make in their own living habits which would place less energy demands on available energy sources. Using your list, conduct a survey to assess people's attitudes. Are people willing to change their habits?

2. Construct a pictorial essay on a social, political, economic, or personal problem associated with conservation of energy.

3. List six (6) things you can do to reduce energy consumption which is not a compromise for quality of life. Practice these measures for at least one month and express how you felt.

4. Conduct an energy audit of your school buildings. List ways energy can be conserved and share it with your principal, custodial staff, teachers, and cafeteria staff.

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*For detailed description, refer to noted Sample Activity.

Theme 4. Conservation

Subject Area SS

Grade Level 7-12

THINGS TO DO (Grade 9)

1. Research different countries and their cultures and compare their conservation practices as expressed by their a) values, b) customs and mores, and c) religion. How are they alike? How are they different?

2. Investigate current conservation measures that are practiced all over the world. How many are mandated by various governments? For example, in Korea, electricity is regulated by government. Anyone using more than his/her fair share is assessed a fine. What are the pros and cons for this method of conservation? Do you feel government should mandate conservation practices in America? Explain. Stage a World Organization meeting to discuss what can be done to conserve energy worldwide.

3. Draw cartoons illustrating conservation problems which might be applicable to the a) pre-historic age, b) Middle Ages, c) Renaissance, d) Industrial Revolution, e) 1920's and f) present. Select the same problem and keep the character the same changing clothing and environment when appropriate. Is the slant or emphasis of the problem the same? Explain.

THINGS TO DO (Grade 10

*1. Survey some car owners and/or drivers and find out how they feel about increasing gas prices. Would they continue to drive as much if gasoline prices rose by $1.00? (See Sample Activity 4-2. "Pay As You Go")

2. Form a group and role play the parts of the President, a senator, an oil company executive, an environmentalist, and J.Q. Public. Discuss the present conservation plans proposed by Congress and the President, e.g., setting air conditioners at 76° F. What would the reactions of each member be?

3. To conserve gasoline, pretend that a decision has been made to reduce the number of automobiles in this country. Draft a set of priorities and regulations to accomplish this as fairly as possible for all citizens.

4. What is a "victory garden?" When did Americans have victory gardens? Do you consider a victory garden a conservation effort? Explain. Make a victory garden at home.

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*For detailed description, refer to noted Sample Activity.

Theme 4. Conservation

Subject Area SS

Grade Level 7-12

THINGS TO DO (Grade 11)

1. Develop an energy conservation presentation for the community that includes displays, shows, speeches, and art work.

2. Call the State Energy Office and find out more about their energy programs. Do they provide consumer information on energy conservation? What services do they provide for the public? Do they have consumer protection programs? Energy education programs?

3. Form teams and observe places of work: a) restaurants, b) gas stations, c) markets, d) hotels, and e) schools. Observe things that have been done to conserve energy. Interview the managers whenever possible and/or talk to workers to find out what has actually been done to conserve energy. Find out how the workers feel about the conservation measures. Report your findings to class.

4. Form groups representing the following policy makers: a) government officials, b) business and industry executives, c) power company executives, d) environmentalists, and e) consumers. Each group should recommend at least five (5) things they would do to a) reduce Hawaii's dependence on foreign oil, b) protect the environment while developing new sources of energy and increasing energy production, c) demand the fairest possible distribution of limited fuel supply. Where conflicts arise, work towards resolving differences through compromises that are satisfactory for the majority of groups.

NOTE: Suggested activities could also be used by students taking related electives in grades 11 and 12.

VOCABULARY

Attitude, car pools, cause and effect, change, choice, conservation, consumers, culture, energy audit, essential, lifestyle, mandate, mass transit, priorities, scarcity, value, victory garden.

THEME 4. Conservation

Subject Area SS (Ag, Bus, LA)
Thematic Area EE, G, LS, VE
Grade Level 7

SAMPLE ACTIVITY 4-1. "Pond Broker"

OBJECTIVE

- To formulate and practice a conservation ethic in regard to energy use and the environment.

CONCEPTS

- The earth's resources are limited.
- Energy conservation is the wise and efficient use of energy.
- Energy conservation will affect and be affected by present and future life styles and cultural conditions.
- Political and cultural interest groups influence the decisions made regarding the development, use, and conservation of particular energy sources.

ESSENTIAL COMPETENCIES

- EC 1. Read and use printed materials from daily life.
- EC 3. Demonstrate writing skills commonly used in daily life.
- EC 4. Communicate orally in situations common to everyday life.
- EC 6. Read and use scales on standard measuring devices.
- EC 8. Reach reasoned solutions to commonly encountered problems.
- EC 9. Distinguish fact from opinion in TV and radio broadcasts, advertising, newspaper and magazine articles, and public speeches.
- EC 10. Use resources for independent learning.
- EC 14. Demonstrate knowledge of the citizen's opportunities to participate in political processes.
- EC 15. Demonstrate knowledge of important citizen rights and responsibilities.

RELATED ENVIRONMENTAL EDUCATION INSTRUCTIONAL GOALS AND/OR OBJECTIVES

- Students will support and practice wise utilization of traditional sources of energy and also support research and development of alternate energy sources. (Goal: pg. D2)
- When faced with decisions concerning the use of earth resources, students will select practices developed in recognition of present and future environmental and human needs. (Goal: pg. D6)
- Students will examine optional courses of action and their consequences for improving the quality of life and will support those that will provide optimum short- and long-term benefits for society and the environment. (Goal: pg. D38)

Theme 4. Conservation

Sample Activity 4-1

Grade Level 7

SOCIAL STUDIES INSTRUCTIONAL OBJECTIVES

- Identify and describe the development of the social, political and economic institutions which evolved in pre-modern Hawaii. (Objective, Grade 7, pg. 25)
- Identify and define the distinctive features that characterize Hawaii today (social, political, economic, religious, etc.) as seen through inferences from the past. (Objective, Grade 7, pg. 25)

SUGGESTED MATERIALS AND/OR RESOURCES

1. Reprint of "The Hawaiian and His Fish Pond", Tales of Old Hawaii by Russ and Peg Apple. Honolulu Star Bulletin, June 12, 1971.
2. Exercise 4.1.
3. Tools and/or instruments such as thermometers, rulers, etc., for their investigation.

Sample Activity 4-1

Grade Level 7

ACTIVITY (Related Core Themes: 2, 3, 5 & 9)

The practice of conserving our natural resources is not new. The early Hawaiians, like people of all times, faced the problem of scarcity but their limited resources were carefully controlled by a sophisticated social system built around the rule of the Alii and the Kapu system. The Ahupuaa was the basic social and economic unit ruled by the Alii and almost every Ahupuaa was economically self-sufficient.

Today with the use of modern and new technology, people are no longer content with satisfying needs but are accustomed to satisfy wants as well. With our dwindling energy resources a serious relook at conservation is required.

In this activity students take a look at conservation measures practiced by the early Hawaiians and possible measures that present day Americans can take. They'll see that somewhere along the way, conservation measures (like the pond) of the past have been lost and/or forgotten by the people

1. Discuss with students the meaning of energy conservation. Ask them if they were aware that conservation of our natural resources is not a new idea.
2. Have them read the article "The Hawaiian and his Fish Pond."
3. Discuss the article and ask them "Why did the Hawaiians bother to build fish ponds when they were surrounded by the ocean? In what way (or ways) is this a conservation measure?" Ask them if they can think of other ways that the early settlers of Hawaii were conservationist. Were the early Hawaiians self-sufficient? Explain.
4. Have them compare the article with the off-shore fishing situation of today. What are some of the problems? Are food fishes still plentiful and easily obtainable? Why are our resources scarce today? Are the people of today still practicing conservationists? Are there any fish ponds today? Why or why not?
5. Have them investigate through observation energy conservation and/or extravagance. (See Exercise 4.1)
6. Have students share their results from Part I of Exercise 4.1.
7. Discuss the questions from Part II of Exercise 4.1.
8. Write a short essay explaining the title "Pond Broker." Who are the pond brokers?

Sample Activity 4-1

Grade Level 7

SUGGESTED FOLLOW-UP/ASSESSMENT ACTIVITIES

Research and find other conservation measures practiced by the early Hawaiians during pre-Cook days. Present your findings to the class either as a skit, collage, poster or slide-tape show.

Theme 4. Conservation | Sample Activity 4-1

Exercise 4.1 | Grade Level 7

"Energy Explorers"

PART I: Directions: Find out more about energy inside and outside your classroom. If you need special tools and/or equipment, ask your teacher.

1. Give an example of the following and prove it!
   a. wasted energy
   b. good use of light (radiant or solar) energy
   c. bad use of light (radiant or solar) energy
   d. good use of heat (visible light, ultra violet, or infrared) energy
   e. bad use of heat (visible light, ultra violet, or infrared) energy
   f. good use of human energy
   g. bad use of human energy
   h. energy conservation
   i energy extravagance
2. Give an example of one thing that uses energy that you would not or could not do without.
3. Give an example of one thing that uses energy that you could or would do without.
4. Give an example of one thing about energy that you would like to see changed.

PART II: Questions for discussion

1. What does it mean to "prove" something?
2. What's the difference between energy wasted and energy extravagance?
3. How did you decide what was a good use of energy? A bad use of energy? An extravagant use of energy? A wasted energy?
4. How could you celebrate your birthday or a holiday such as Christmas without using "excessive amounts" of energy?
5. According to the article "The Hawaiian and his Fish Pond," the early Hawaiians had government controlled measures to conserve their resources. How did the rulers conserve their natural resources? Should we have more government regulations to control our use of energy resources? Would you want to be told when, where and what quantities of energy can be used?

Theme 4. Conservation

Sample Activity 4-1

Grade Level 7

The Hawaiian and His Fish Pond[1]

by Russ and Peg Apple

Two fish ponds have surfaced in the news, and it's time for a briefing on Hawaiian fish ponds in general.

Molii fish pond, near Chinaman's Hat on Kaneohe Bay, Oahu, still is an operating pond which grows fish for the market. It's in the news because the State wants to acquire it, add it to an adjacent State Park project and operate it.

Kaloko fish pond, in North Kona on the Big Island hasn't been operated for years. It's in the news because its owner wants to center a resort development around the pond. There are conservationists both for and against his plans.

In the time of Kamehameha the Great, there may have been as many as 210 operating fish ponds on all the Islands. By 1870, the number was down to about 200. In 1960, there were six operating ponds on Oahu, four on Molokai, and plenty of non-operating ponds still visible.

Reduction in numbers may be attributed to migrations of Hawaiians away from Hawaii's coastal areas; to the general decline in the Hawaiian population; the high cost of ice in more modern times to transport fish to distant markets; the availability of fish imported from elsewhere; and some changes in the eating habits of Island consumers.

Ponds long unused silt up or become choked with vegetation.

Fish ponds were important to the ancient and historic Hawaiians.

There were a number of reasons, natural as well as Hawaiian, why the Islanders could not depend on the ocean for an always available food-gathering source.

Storms and high seas sometimes kept Hawaiian canoes from exposed waters.

Fish supplies waxed and waned.

For conservation reasons, ruling chiefs imposed fishing seasons. The most famous was the alternating season of aku (ocean bonito) and opelu (mackerel).

When the aku season was open the spawning opelu was kapu.

When the opelu season was open, the spawning aku was protected.

Each season was a half year long.

Certain off-shore fishing grounds were intermittently closed waters. When the higher chiefs wanted to go fishing, they had their lesser chiefs set up sticks along the shore to mark the area as reserved. Each stick flew a white piece of tapa.

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[1] Reprinted with permission of the Honolulu Star-Bulletin, June 12, 1971.

This put the in-shore areas out of use as well.

At times, seaweeds, especially those eaten by fish were kapu.

Certain fish were always reserved for high chiefs, and when caught, canoe chiefs and runners saw they were delivered fresh.

Some fish were only eaten by men. Women never got a taste.

Wars or large public works projects, such as the building of a temple, reduced the number of men available for fishing.

Forget the idea that a hungry Hawaiian could always catch a fish from the sea. It never was that way.

But fish ponds evened up the fish supply.

To insure a constant, dependable supply of their principal source of protein, the Hawaiians built and operated fish ponds.

Fish ponds were built wherever natural features permitted.

Hawaii's Hawaiian historian Samuel Kamakau wrote, "a land with many fish ponds."

Fish ponds did limit the variety of fish available, but the supply was dependable.

They tided those permitted to use them over periods when ocean fishing was prohibited, dangerous or poor.

Hawaiians developed the use of fish ponds to a greater extent than other Polynesians, and possibly more than any other people.

Hawaiian fish ponds were considered a part of the land. Thus, when ocean fishing was kapu, fish could still be harvested from the ponds.

High seas and storms did not stop fish pond use.

Fish raised in the ponds were mostly 'ama'ama (mullet) and awa (milk fish). These were raised in the high-walled ponds built along the shore. Such as Molii and Kaloko.

Adult mullet and milk fish only went to the owner, a high chief. He distributed those he didn't eat or give to his immediate family down to his lesser chiefs.

The lesser chiefs feasted, and if any pond fish were left, passed them down to still lesser chiefs.

Down at the bottom of the ladder were the commoners. If there were plenty of fish in a well managed pond, they might in time of need get some. Or in a time of plenty.

Forget the idea that a hungry Hawaiian could always catch a fish from the nearest fish pond. It never was that way.

* * * * *

THEME 4. Conservation

Subject Area SS (Bus, H, LA)
Thematic Area EE, CE, G, LS, SA, VE
Grade Level 10

SAMPLE ACTIVITY 4-2. "Pay As You Go"

OBJECTIVE

- To formulate and practice a conservation ethic in regard to energy use and the environment.

CONCEPTS

- The earth's resources are limited.
- Energy conservation is the wise and efficient use of energy.
- Energy conservation will affect and be affected by present and future life styles and cultural conditions.
- Political and cultural interest groups influence the decisions made regarding the development, use, and conservation of particular energy sources.

ESSENTIAL COMPETENCIES

- EC 1. Read and use printed materials from daily life.
- EC 2. Complete commonly used forms.
- EC 3. Demonstrate writing skills commonly used in daily life.
- EC 4. Communicate orally in situations common to everyday life.
- EC 6. Read and use scales on standard measuring devices.
- EC 8. Reach reasoned solutions to commonly encountered problems.
- EC 10. Use resources for independent learning.
- EC 12. Identify the training, skill and background requirements of at least one occupation in which the student in interested.
- EC 14. Demonstrate knowledge of the citizen's opportunities to participate in political processes.
- EC 15. Demonstrate knowledge of important citizen rights and responsibilities.

RELATED ENVIRONMENTAL EDUCATION INSTRUCTIONAL GOALS AND/OR OBJECTIVES

- Students will support and practice wise utilization of traditional sources of energy and also support research and development of alternate energy sources. (Goal: pg. D2)
- When faced with decisions concerning the use of earth resources, students will select practices developed in recognition of present and future environmental and human needs. (Goal: pg. D6)
- Students will examine optional courses of action and their consequences for improving the quality of life and will support those that will provide optimum short- and long-term benefits for society and the environment. (Goal: pg. D38)

Sample Activity 4-2

Grade Level 10

SOCIAL STUDIES INSTRUCTIONAL OBJECTIVES

- Explain the nature and function of law and its impact on people's lives. (Objective: pg. 44)
- Identify and explain the process of making and changing laws and the role of the people in this process. (Objective: pg. 44)
- Identify and explain alternate viewpoints, interests, and values of a legal and political issue. (Objective: pg. 44)
- Recognize when personal and individual rights have been or are being violated and know what remedies are available. (Objective: pg. 44)

SUGGESTED MATERIALS AND/OR RESOURCES

Worksheet 4.2.

Sample Activity 4-2
Grade Level 10

ACTIVITY (Related Core Themes: 3, 5, 6, 8, 9 & 10)

A basic economic problem is scarcity. There never seems to be enough supply to meet the demands. This is true of energy. The ever increasing wants coupled by our growing population have raised our consumption level to new heights. While it is true that our economic system would exist without the energy sources that we are currently accustomed to, our standard of living and certainly our life style as we know it, would not. At what cost would our life style exist as we know it today? What sacrifices are we willing to make? What sacrifices must we make?

This activity attempts to show the relationships of shortages, price increases, creativity and/or innovativeness, and opportunity costs. It is aimed at providing students with an opportunity to personally contribute to easing the energy crisis.

1. Have students discuss the energy situation and the various conservation measures they are aware of. Ask them if price of energy resources were to increase significantly, would people be more inclined to alter their life styles? Would they become more apt to find out what's going on to cause the increase?
2. Tell students to survey some car owners to find out how they feel about increasing gas prices. (See Worksheet 4.2.)
3. Record the students' survey data on the blackboard and discuss the following questions:
   a. What is the relationship of gasoline usage and price?
   b. What do you suppose would happen if the gasoline prices were to go down? What would you do?
   c. According to the survey, how much would the price of gasoline need to increase before people start to greatly reduce the amount they use?
   d. How are people now coping with the increasing costs of gasoline?
   e. Was there a difference in response among the various car groups; e.g. sub-compact vs. large cars? Why or why not?
   f. What is opportunity costs? What are some of the opportunity costs involved with our use of the automobile?
   g. What are some of the environmental benefits reaped from increased gas prices?
   h. What effect would the reduction of gas use and the increase of compact cars have on our auto industries? Our economy?
4. Discuss with the students other conservation measures such as those proposed below. Are the proposals practical and inforceable? What are the economic effects of each proposal?

ACTIVITY (Cont'd.)

Proposals:

A. Increase the minimum age for driver's licenses and permits to 21

B. Allow only one automobile per household.

C. Ban all students from driving to school if bus transportation is available.

5. Discuss the following questions with the students. "Is it better to use the price system or government regulation for conservation of our scarce resources?"

SUGGESTED FOLLOW-UP/ASSESSMENT ACTIVITIES

Write proposals regarding school conservation measures that you feel are practical and enforceable. Present them to your class and as a group decide on the best five. Present them to your school principal for approval and possibly enforcement.

Theme 4. Conservation

Sample Activity 4-2
Grade Level 10

"Pay As You Go"

Directions:
1. Survey some car owners or drivers and find out how they feel about increasing gas prices.
2. Ask the question: "If the price of gasoline were to increase by ______¢ (read the amount) per gallon, would you be likely to use your car a little less often, seldom, or not at all?"

Type of Car	Use of Car	Increase In Prices					Comments
		10¢	20¢	50¢	$1.00	$2.00	
Sub-Compact Cars	As much as now						
	A little less often						
	Seldom or not at all						
Compact Cars	As much as now						
	A little less often						
	Seldom or not at all						
Medium Sized Cars	As much as now						
	A little less often						
	Seldom or not at all						
Large Size Car	As much as now						
	A little less often						
	Seldom or not at all						

THEME 5. HUMAN DIMENSIONS OF ENERGY

BACKGROUND

This theme focuses on the importance of each individual's understanding of the relationships between personal choices of energy use and the quality of life for all. It explores the interrelationships among the concepts of standard of living, lifestyles, personal and cultural value systems, and social responsibility in the context of the "net" cost of energy production and use.

Demands of lifestyles resulting from technological achievements have produced an enormous increase in the demand for energy resources. The dependence on limited and/or costly supplies of energy to satisfy the needs and wants of humans has resulted in a problem that affects the lives of all people.

As individuals, we daily affect and are affected by the problems associated with energy use and our environment. To help solve these problems, we can find many ways to make better and more efficient use of energy without serious consequences to the environment or economy. In many instances, new attitudes and altered lifestyles will be necessary to conserve energy and eliminate the waste of resources. Individual efforts, when taken collectively, can result in substantial conservation of energy and other scarce resources. These efforts can also influence public policy making and/or governmental regulations in the areas of energy, environment, and economics.

Understanding of this theme will help students to formulate personal values which enable them to make competent energy choices and act responsibly to meet the challenges presented by energy shortages, threats to the environment and related economic problems. It will also help them realize personal commitments to responsibilities and cooperative actions for mutual benefit in terms of energy use and the environment.

FOUNDATION PROGRAM OBJECTIVES

FPO 1. Develop basic skills for learning and effective communication with others.
FPO 2. Develop positive self-concept.
FPO 3. Develop decision-making and problem-solving skills at the student's proficiency level.
FPO 4. Develop independence in learning.
FPO 5. Develop physical, social and emotional health.
FPO 6. Recognize and pursue career development as an integral part of growth and development.
FPO 7. Develop a continually growing philosophy such that the student is responsible to self as well as to others.
FPO 8. Develop creative potential and aesthetic sensitivity.

CORE THEME OBJECTIVE

To understand that personal values and choices of energy use will affect the quality of life for all.

Theme 5. Human Dimensions of Energy

CONCEPTS

1. Energy use decisions affect standards of living.
2. Individual and social values affect patterns of energy consumption.
3. Values and attitudes toward energy use and the environment are influenced by cultural, economic, political and social factors.
4. There are ethical, legal, aesthetic, social, political, economic, biological and physical benefits and costs associated with energy choices.

112

Theme 5. Human Dimensions of Energy

RELATED GOALS AND/OR GENERAL OBJECTIVES OF SUBJECT AREA GUIDES

AGRICULTURE: (pg. 59 - Unit VII) Agriculture is faced with environmental problems that are both internal and external.

ART: (pg. 7 - Objective) Make and justify judgments about works of art and the selection of art products used in daily living.

ASIAN, EUROPEAN AND PACIFIC LANGUAGES: (pg. 5 - Goal) To understand, through the second language, the contemporary values and behavior patterns of the people whose language is being learned.

BASIC PRACTICAL ARTS: (pg. 4 - Objective) To effectively utilize the resources of our technological world and to understand the importance of conservation.

BUSINESS EDUCATION: (pg. V - Objectives) 1. To live effectively in today's economic environment. 2. To meet the ever changing demand of the business world of work.

HEALTH: (pg. iii & 1 - Goal) Through a developmental health education program, students will acquire accurate health information, and gain experiences contributing to attitudes, values and responsible health practices; students will be able to make decisions relating to their health and understand how these decisions affect them and the society in which they live.

HOME ECONOMICS: (pg. iii - Objective) Make and carry out intelligent decisions regarding the use of personal, family, and community resources.

INDUSTRIAL ARTS/INDUS-TECH: (pg. 2 - Objective) Apply technical knowledge and techniques for effective living in situations such as recreation, consumption, occupation, and education.

LANGUAGE ARTS: (pg. 4 - Goal) To assist students to develop the highest degree of informed control of which they are capable over their use of language.

MATHEMATICS: (pg. 13 - Goal) Nurture intellectual curiosity and promote the desire to continue learning.

MUSIC: (pg. 2 - Objective) Use musical skills in communicating ideas, thoughts and feelings.

PHYSICAL EDUCATION: (pg. 106 - Objective) Acquire the habit of participating in wholesome recreational activities.

SCIENCE: (pg. A-13 & 14 - Objectives) 1. Foster the students' appreciation for the practical and aesthetic contribution of science to the improvement of quality of life and to promote in our students the desire to take an active part in that contribution. 2. Facilitate the students' ability to use scientific knowledge, processes, instruments and scientific language to clarify values, examine issues, solve problems in fulfilling personal, social and career life roles. 3. Encourage students to maintain a safe and healthy environment.

SOCIAL STUDIES: (pg. 11 - Objective) The students is able to clarify value conflicts or communication problems which affect choices, decisions, or relationships.

Theme 5. Human Dimensions of Energy

Subject Area SS

Grade Level 7-12

THINGS TO DO (Grade 7)

1. What is the relationship between culture and value? Did the ancient Hawaiians' cultural beliefs teach them to value their environment? Explain. Cite examples to support your answer.

2. Show how cultural beliefs affected energy use and production. Make a collage or a pictorial essay to illustrate this point. How did the rulers influence energy use and production?

3. If Hawaii had to cut back their use of energy, which energy consumers should receive first priority? What criteria would you use in making these judgments? Is your priority list and allocation plan fair? Defend and support your answers.

THINGS TO DO (Grade 8)

*1. What would you do if you were told to cut back your energy use by 20%? What would you be willing to do without? Would you try to find ways to get around the cutback? (See Sample Activity 5-1. "You Owe To You")

2. Write a paper describing how you would feel and what you would do if the government decided to ration energy use in the home, e.g., cut back on electrical use, gasoline, etc. Why are individuals reluctant to give up their conveniences? Is it an issue of rights and privileges versus responsibilities? Explain.

3. What is your role as a citizen regarding energy conservation. Write a paper pledging your assistance and your plans to carry out conservation measures. Follow your plan for a week or two. Write a paper expressing how you felt during the period.

4. Make a list of all your leisure time activities. Cross off from the list all the activities you would be willing to sacrifice for one month. Are the activities crossed off the ones that consume the most energy? Make a chart and monitor yourself to see if you are able to carry out your plans.

5. Make a list of activities you normally do with your family. Figure out the amount of energy used for each activity. Is there a relationship between the degree of interaction (passive or active; individual or group) and the energy used? Explain.

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*For detailed description, refer to noted Sample Activity.

THINGS TO DO (Grade 9)

1. Many people have said that conservation will lower our quality of life and/or standard of living. Study the standard of living of various countries. Is there a relationship between standard of living and energy consumption? How about quality of life? How do attitudes and values affect our quality of life? What arguments could you use to support the notion that reduced energy consumption does not mean a lower standard of living?

2. Although much of our energy is used by sectors of the community other than the individual household, it is still true that the average American uses much more than individuals of other countries. According to the Department of Energy, in 1970 an average American used 300 million BTU/year while a Russian used 130 million BTU/year and a Chinese 13 million BTU/year. Debate the resolution: "All peoples of the world should be allowed equal amounts of energy use each year."

3. Research the lifestyle of the Australian aborigines, the Eskimos, and the tribes of the Kalahari Desert. What energy resources do they have? With scarcity of resources facing Americans, what lessons could we learn from them? How would our lifestyle be modified?

THINGS TO DO (Grade 10)

*1. Conduct a survey of various groups of people in the community to find out how they feel about different kinds of conservation measures. Are there certain conservation measures that people tend to object to? Commonly agree to? (See Sample Activity 5-2. "A Matter of Choice")

2. Do you feel that the public was forewarned about the energy crunch? Find out by checking all magazines and/or newspapers. Were the predictions accurate? If the public was forewarned, when did the "warning" start? Cite articles to support your answers.

3. For one week substitute your energy consuming recreational activities with a less energy intensive activity. At the end of the week, write a report expressing a) how you felt, b) your willingness to give up certain activities, c) what you've learned about yourself, and d) your willingness to convince someone else to give up similar activities for short periods of time.

4. Show how people's concerns are expressed in music and poems. Make a slide/tape presentation using a song or poem to convey an energy related issue or problem.

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*For detailed description, refer to noted Sample Activity.

THINGS TO DO (Grade 11)

1. Simulate a legislative hearing investigating the possibilities of outlawing a) late night or all-night television, b) night games at the Aloha Stadium and NBC Arena, c) drag racing at Campbell Industrial Park, d) all night school activities, 3) others.

2. In the past, people have been motivated to use more energy. What are the possibilities of reversing this trend? How can you promote the reduction of energy consumption? Choose an energy intensive product or activity. Write or draw an advertisement promoting the reduction of energy consumption as something desirable and the "in" thing to do by creating desire to shun or avoid the product or activity. Share your idea with your classmates. Try to have it published in your school newspaper.

3. Given the following six (6) categories of business and industry, rank them in the order of importance to you and your community.

   a) Military
   b) Utility Companies
   c) Transportation
   d) Tourism
   e) Agriculture
   f) Recreation

   Compare your rankings with others in the class. How do they compare?

NOTE: Suggested activities could also be used by students taking related electives in grades 11 and 12.

VOCABULARY

Beliefs, causality, change, choice, consensus, conservation ethic, consumer, conveniences, cooperation, culture, energy audit, habit, standard of living, lifestyle, motivation, nonrecyclable, responsibility, role, scarcity, quality of life, supply and demand, value, wants.

THEME 5. Human Dimensions of Energy

Subject Area SS (LA)
Thematic Area EE (G, VE)
Grade Level 8

SAMPLE ACTIVITY 5-1. "You Owe It To You"

OBJECTIVE

- To understand that personal values and choices of energy use will affect the quality of life for all.

CONCEPTS

- Energy use decisions affect standards of living.
- Individual and social values affect patterns of energy consumption.
- Values and attitudes toward energy use and the environment are influenced by cultural, economic, political and social factors.
- There are ethical, legal, aesthetic, social, political, economic, biological and physical benefits and costs associated with energy choices.

ESSENTIAL COMPETENCIES

- EC 1. Read and use printed materials from daily life.
- EC 3. Demonstrate writing skills commonly used in daily life.
- EC 4. Communicate orally in situations common to everyday life.
- EC 8. Reach reasoned solutions to commonly encountered problems.
- EC 15. Demonstrate knowledge of important citizen rights and responsibilities.

RELATED ENVIRONMENTAL EDUCATION INSTRUCTIONAL GOALS AND/OR OBJECTIVES

- Students will support and practice wise utilization of traditional sources of energy and also support research and development of alternate energy sources. (Goal: pg. D2)
- When faced with decisions concerning the use of earth resources, students will select practices developed in recognition of present and future environmental and human needs. (Goal: pg. D6)

SOCIAL STUDIES INSTRUCTIONAL OBJECTIVES

- Define the concept of rights and freedoms of individuals in American society in terms of constitutional rights and liberties. (Objective: pg. 28)
- Identify the major economic and consumer problems confronting American society today, describe and explain some probable causes and the effects on the nation and its people. (Objective: pg. 28)
- Identify significant personal problems confronting oneself today and possibly in the future, describe and explain some probable causes and effects on the individual presently and in the future. (Objective: pg. 28)

Theme 5. Human Dimensions of Energy

Sample Activity 5-1

Grade Level 8

SUGGESTED MATERIALS AND/OR RESOURCES

Exercise 5.1.

Sample Activity 5-1

Grade Level 8

ACTIVITY (Related Core Themes: 3, 4 & 10)

As individuals, we daily affect and are affected by the problems associated with energy use and our environment. The solution to these problems rests with people and their ingenuity, and creativity, coupled with common sense and wise use of existing resources.

This activity will give students the opportunity to formulate personal values which hopefully will enable them to make competent energy choices and act responsibly to meet the challenges presented by dwindling fossil fuel energy resources. It also tries to help students realize that cooperation for mutual benefits is necessary in meeting the energy challenge.

1. Discuss with students our current situation regarding energy resources. Do you feel there really is a shortage? Why or why not?
2. Remind students that even if they feel that there is no energy shortage, our fossil fuel resources are dwindling and being used up at a faster rate than they are being produced. Ask them what they would do if they were mandated to cut back 20% of the current use of energy? Electricity? Gasoline?
3. Have students read the story "De-lighted" in Exercise 5.1.
4. Discuss the questions from Exercise 5.1.

SUGGESTED FOLLOW-UP/ASSESSMENT ACTIVITIES

Make yourself an "Energy Use Report Card" by making a list of various conservation measures you personally can implement at home and school. Next to the list make columns with days of the week. (Make a month's log.) Each time you practice or follow through with the conservation measure, mark the space with a plus (+), otherwise leave it blank. See if you can encourage other members of your family to keep an "Energy Use Report Card."

"De-lighted"

B. Concerned

The wind was howling and a cold chill ran through every inch of my body as I stood at the window watching the large drops of water splatter on the ground. I turned and walked to the living room to watch television when the lights began to flicker. "Oh, oh," I thought, "the violent storm has probably damaged the local electrical power system." I turned the set on just in time to hear a bulletin interrupt "Charley's Angels." "We interrupt this program to bring you an important message," the voice said. "We are asking all residents to use electricity very sparingly since the power plant was damaged by the storm and is not generating at full power. We ask for your cooperation so that enough electricity is available for the local hospitals and for other vital service areas. If there are any questions please call the Emergency Hot Line at 833-6959." Quickly I jotted the number down and turned the TV set and all lights off. "It's a good thing I bought candles the other day," I mused.

Later, I settled into my easy chair armed with a book and candle. "A good chance to catch up with my reading," I thought. Just then,I heard some music and laughter. The sounds seemed to be coming from outside my window. As I walked over I could see that my neighbor had all of his lights on and his television set going full blast. "Surely," I thought, "he must have heard the news bulletin." "How awful," I exclaimed, "Why should I be rationing when my neighbor seems to be enjoying himself. I should go out there and give him a piece of my mind. Better still, I think I'll report him to the Emergency Hot Line."

1. If you were Mr. B. Concerned, what would you do?

2. According to the story, why was Mr. B. Concerned upset with his neighbor?

3. How would you describe Mr. B. Concerned's neighbor?

4. If Mr. B. Concerned went over to talk to his neighbor, what do you think the neighbor's excuse would be for his lights and TV being on? If he has no excuse, what might his attitude and/or feelings be toward Mr. B. Concerned? His fellow citizens?

5. Do you feel that Mr. B. Concerned's neighbor was within his rights in using electricity for the television and lights? Why or why not? Do you feel the neighbor was acting responsibly? Why or why not?

6. Write your own ending for this story.

THEME 5. Human Dimensions of Energy

Subject Area SS (BEc, BPA, LA)
Thematic Area EE (G, VE)
Grade Level 10

SAMPLE ACTIVITY 5-2. "A Matter of Choice"

OBJECTIVE

- To understand that personal values and choices of energy use will affect the quality of life for all.

CONCEPTS

- Energy use decisions affect standards of living.
- Individual and social values affect patterns of energy consumption.
- Values and attitudes toward energy use and the environment are influenced by cultural, economic, political and social factors.
- There are ethical, legal, aesthetic, social, political, economic, biological and physical benefits and costs associated with energy choices.

ESSENTIAL COMPETENCIES

- EC 1. Read and use printed materials from daily life.
- EC 2. Complete commonly used forms.
- EC 3. Demonstrate writing skills commonly used in daily life.
- EC 4. Communicate orally in situations common to everyday life.
- EC 8. Reach reasoned solutions to commonly encountered problems.
- EC 9. Distinguish fact from opinion in TV and radio news broadcasts, advertising, newspaper and magazine articles, and public speeches.
- EC 10. Use resources for independent learning.
- EC 14. Demonstrate knowledge of the citizen's opportunities to participate in political processes.
- EC 15. Demonstrate knowledge of important citizen rights and responsibilities.

RELATED ENVIRONMENTAL EDUCATION INSTRUCTIONAL GOALS AND/OR OBJECTIVES

- Students will support and practice wise utilization of traditional sources of energy and also support research and development of alternate energy sources. (Goal: pg. D2)
- When faced with decisions concerning the use of earth resources, students will select practices developed in recognition of present and future environmental and human needs. (Goal: pg. D6)
- Students will examine optional courses of action and their consequences for improving the quality of life and will support those that will provide optimum short- and long-term benefits for society and the environment. (Goal: pg. D38)

Theme 5. Human Dimensions of Energy

Sample Activity 5-2

Grade Level 10

SOCIAL STUDIES INSTRUCTIONAL OBJECTIVES

- Identify and explain the process of making and changing laws and the role of the people in this process. (Objective: pg. 44)
- Identify and explain alternative viewpoints, interests, and values of a legal and political issue. (Objective: pg. 44)

SUGGESTED MATERIALS AND/OR RESOURCES

Exercise 5.2.

Theme 5. Human Dimensions of Energy

Sample Activity 5-2

Grade Level 10

ACTIVITY (Related Core Themes: 3, 4, 10)

Energy, once considered a cheap commodity, is now very expensive with prices continually escalating. The absence of cheap energy will affect our life styles and the way we produce and consume goods and services. What should be done to cut down our use of energy with the least harmful effects on our standard of living? Should we use the market system or command system to allocate scarce energy resources? How will personal values affect each individual's decision regarding energy use and production? What measures should we take to avoid and/or reduce energy shortages for the future?

In this activity, students will be exposed to a number of proposals and the impacts these proposals may have on their lives.

1. Discuss with students the idea that the energy problem is one of scarcity and hence one of supply and demand.
2. Discuss ways in which lifestyles and/or standards of living may be affected.
3. Discuss various measures that can be taken to solve this economic problem of scarcity, i.e. production and distribution.
4. Administer the "Energy Survey" from Exercise 5.2 to the students. Do not grade these sheets. Discuss their results; their agreements and disagreements for each proposal. How do you think other people would feel about these proposals? Would different age groups respond differently to each proposal? How can you find out?
5. Divide the class into groups - have them administer the "Energy Survey" (Exercise 5.2) to various groups such as:
    a. different age groups
    b. females and males
    c. different occupations
    d. etc.
6. Have students share their findings and as a class summarize the results and draw some conclusions about the practicality and/or appropriateness for each proposal.

SUGGESTED FOLLOW-UP/ASSESSMENT ACTIVITIES

Write a proposal of your own and be prepared to give supportive reasons and/or evidences for its immediate adoption.

Theme 5. Human Dimensions of Energy Sample Activity 5-2

Exercise 5.2 Grade Level 10

"Energy Survey"

1. Administer this survey to various age groups such as students, your parents, teachers, and other adults in your community.
2. When conducting your survey, be sure to categorize it so that you have your results by age groups.

WE SHOULD:	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
1. Increase the price of gasoline by 50 cents a gallon to cut down on gasoline use.					
2. Increase the age at which a person can get a driver's license from 16 to 18.					
3. Lower air pollution standards so industries can burn high sulfur coal rather than oil or natural gas.					
4. Ban all students from driving to school if bus transportation is available.					
5. Ban all driving of private cars on Sunday.					
6. Ration gasoline so every driver can obtain only a certain amount.					
7. Ban the use of recreational vehicles such as mopeds, mini-bikes, golf cars, and pleasure motorboats.					
8. Reduce city streetlights by at least 25 percent.					
9. Ban auto racing to save fuel.					
10. Ban the use of all nonessential household appliances such as electric garage-door openers, electric can openers, color TV's, electric toothbrushes, garbage disposals, blenders, and stereo systems.					
11. Double the price of electricity and natural gas to discourage household use.					

WE SHOULD:	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
12. Ban the use of air conditioners in all buildings with windows.					
13. Reduce oil imports by 20 percent.					
14. Reduce oil and natural gas supplies to all industries by 20 percent					
15. Lower pollution standards on new cars so they can get better mileage.					

Analyzing the Survey:

1. Did different groups react differently to your survey? If so, in what way?

2. Which proposals seem to be strongly favored by all the groups you surveyed?

3. Which proposal seems to be unpopular by all the groups you surveyed?

4. Make a one sentence statement for each group to summarize how they felt about the proposals in general.

5. After conducting the survey, did you change your mind about any of the proposals? Why or why not?

THEME 6. ENERGY ALTERNATIVES

BACKGROUND

Alternative sources and uses of energy are analyzed in Theme 6 in relation to the search for solutions to the world-wide problem of fossil fuel energy shortages. Criteria for selection of future sources of energy are also identified. In addition, the relative advantages and disadvantages of a wide range of alternative energy sources and uses are evaluated.

This theme emphasizes the research and development of technology for utilizing inexhaustible and/or renewable energy sources such as solar, nuclear, geothermal, and biomass to supply and meet future energy demands. It also considers the scope of the search for energy alternatives in relation to the impact on the environment and the needs and interests of individuals and societies.

Theme 6 should make students aware that some of the earth's resources are limited and exhaustible. Therefore, our dependence on and demand for increasing amounts of fossil fuels must change if we are to maintain our present lifestyles. Students should be encouraged to support the research and development of alternative sources and uses of energy which are appropriate to their needs and lifestyles. They can also view and practice conservation as an energy alternative or part of the search and solution for more efficient uses of energy.

FOUNDATION PROGRAM OBJECTIVES

FPO 1. Develop basic skills for learning and effective communication with others.
FPO 2. Develop positive self-concept.
FPO 3. Develop decision-making and problem-solving skills at the student's proficiency level.
FPO 4. Develop independence in learning.

CORE THEME OBJECTIVE

To know alternative energy sources and uses.

Theme 6. Energy Alternatives

CONCEPTS

1. Future sources should have high energy potential, be retrievable, easily obtainable, economically feasible, efficient for conversion, safe, healthful and environmentally noncontaminating.
2. New energy sources are being studied for future use. Research is now being done to harness the following energy sources for the future:
   a. fossil fuels sources: oil shale, tar sands and coal gasification.
   b. natural or continuous sources: geothermal, solar, tidal and wind.
   c. other sources: hydrogen, fuel cells, magnets, hydrodynamics, burning of trash, nuclear fission, breeder reactors and thermonuclear fusion.
3. The development and use of alternative energy sources will affect and be affected by the attitudes, values and lifestyles of individuals and societies.
4. Alternate energy sources indigenous to Hawaii include geothermal, ocean thermal energy conversion (OTEC), biomass, solar, wind and hydroelectricity.

Theme 6. Energy Alternatives

RELATED GOALS AND/OR GENERAL OBJECTIVES OF SUBJECT AREA GUIDES

AGRICULTURE: (pg. 61 - Unit IX) Continued research and experimentation are required for advancement in agricultural productivity and human's well being.

ART: (pg. 7 - Objective) Use the potentialities of art and take action to shape and enhance the quality of one's personal and public environment.

ASIAN, EUROPEAN AND PACIFIC LANGUAGES: (pg. 7 - Goal) An understanding of how governments are similar to and different from our own in solving their problems.

BASIC PRACTICAL ARTS: (pg. 4 - Objective) To effectively utilize the resources of our technological world and to understand the importance of conservation.

BUSINESS EDUCATION: (pg. V - Objectives) 1. To live effectively in today's economic environment. 2. To meet the ever-changing demands of the business world of work.

HOME ECONOMICS: (pg. iii - Objective) Perform the tasks of maintaining a home in such a way that will contribute effectively to furthering individual and family goals.

INDUSTRIAL ARTS/INDUS-TECH: (pg. 2 - Objective) Apply technical knowledge and techniques for effective living in situations such as recreation, consumption, occupation, and education.

LANGUAGE ARTS: (pg. 4 - Goal) To assist students to develop the highest degree of informed control of which they are capable over their use of language.

MATHEMATICS: (pg. 13 - Goal) Develop understanding of the importance and relevance of mathematics historically and in the world today.

SCIENCE: (pg. A-13 - Objective) Help students gain experience with the potentialities and limitations of the methods of scientific and social investigation but at the same time recognize that the environment can be interpreted and manipulated.

SOCIAL STUDIES: (pg. 11 - Objective) The student is able to participate actively and responsibly in collective decisions affecting the social, economic, political, or physical environment in which he or she lives.

Theme 6. Energy Alternatives

Subject Area SS

Grade Level 7-12

THINGS TO DO (Grade 7)

1. Explain why Hawaii's geological features make the development of alternate energy explorations such as OTEC (ocean thermal energy conversion) and geothermal wells more feasible than other sites in the continental U.S.A.? What other alternatives might be considered? Did Hawaii's geographic isolation spur the development of alternate energy studies? Explain.

2. Based on the geographic features of each of the Hawaiian islands, which islands would be best suited for a) biomass conversion plants; b) geothermal wells; c) OTEC plants; d) wind farms; e) waste energy recovery plants; f) solar energy fields; g) others?

THINGS TO DO (Grade 8)

1. Stage a debate on the pros and cons of a given alternate energy source. Do values and attitudes affect our choices?

2. Discuss your position on tax incentives given for using solar energy in the home and/or business. Do you feel that legislation should make the use of solar water heaters mandatory? Why or why not? What are heat pumps? Do you feel that tax credit should be given for heat pumps? Why or why not?

3. What are some of the environmental/ecological issues concerning alternate energy sources? Do you feel that there is too much concern with environmental trade-offs? Why or why not?

THINGS TO DO (Grade 9)

1. Find out more about alternative energy projects being carried out in various parts of the world. How successful are these projects? Would these projects be feasible in all parts of the world? Explain. Do you think that values and attitudes of various cultures will affect the future developments of energy alternatives? Explain.

2. Study the energy alternatives that are now under consideration. Were any of them used in the past? Make a time-line chart showing where, when, and how they were used. (For example, wind energy was used many years ago to carry water from one place to another.)

THINGS TO DO (Grade 10)

1. Develop a chart to indicate cost, adequacy, technological readiness, reliability, environmental hazards and future potential for one of the following sources of energy: a) offshore drilling, b) oil shale, c) solar power, d) nuclear power, e) geothermal wells, f) wind farms, g) coal gasification, h) coal liquefaction, i) pyrolysis, j) OTEC, k) hydrogen fuel, l) others.

2. Write to congresspersons and the President encouraging them to support solar energy. Inquire about Hawaii's solar energy legislation and investigate the nature of similar legislation passed in other states.

THINGS TO DO (Grade 11)

*1. Discuss the various alternate energy projects in Hawaii. Rank the projects in terms of their importance. (See Sample Activity 6-1. "Watt's the Alternative?")

2. Discuss the feasibility of converting the electrical energy industry in Hawaii to nuclear power plants and compare the merits of such a proposal with other options such as coal fueled plants.

3. Identify buildings in the community that waste energy and offer possible conservation programs as solutions. Investigate the building codes to see if solar energy is being encouraged or discouraged. If the latter, what possible changes could be made? How?

4. Form a number of groups, each investigating a different source of alternate energy. Find out the long-term strengths and weaknesses of each and the immediate effects on our State. Using charts, graphs, and other visuals, report your findings in class.

NOTE: Suggested activities could also be used by students taking related electives in grades 11 and 12.

VOCABULARY

Aesthetics, alternate energy, biomass conversion, coal gasification, coal liquefaction, environmental quality, fuel cell, gasohol, geothermal energy, hydrogen fuel, nuclear energy, offshore drilling, OTEC, pyrolysis, shale oil, solar energy, trade-offs, wind energy.

THEME 6. Energy Alternatives

Subject Area SS (Bus, LA, M, Sc)
Thematic Area EE, CE, G, LS, VE
Grade Level 11

SAMPLE ACTIVITY 6-1. "Watt's The Alternative?"

OBJECTIVE

- To know alternative energy sources and uses.

CONCEPTS

- Future sources should have high energy potential, be retrievable, easily obtainable, economically feasible, efficient for conversion, safe, healthful and environmentally noncontaminating.
- New energy sources are being studied for future use. Research is now being done to harness the following energy sources for the future:
  a. fossil fuels: oil shale, tar sands and coal gasification.
  b. natural or continuous sources: geothermal, solar, tidal and wind.
  c. other sources: hydrogen, fuel cells, magnets, hydrodynamics. burning of trash, nuclear fission, breeder reactors and thermonuclear fusion.
- The development and use of alternative energy sources will affect and be affected by the attitudes, values and lifestyles of individuals and societies.
- Alternate energy sources indigenous to Hawaii include geothermal, ocean thermal energy conversion (OTEC), biomass, solar, wind and hydroelectricity.

ESSENTIAL COMPETENCIES

- EC 1. Read and use printed materials from daily life.
- EC 3. Demonstrate writing skills commonly used in daily life.
- EC 4. Communicate orally in situations common to everyday life.
- EC 5. Use computational skills in situations common to everyday life.
- EC 8. Reach reasoned solutions to commonly encountered problems.
- EC 9. Distinguish fact from opinion in TV and radio news broadcasts, advertising, newspaper and magazine articles, and public speeches.
- EC 10. Use resources for independent learning.
- EC 12. Identify the training, skill and background requirments of at least one occupation in which the student is interested.
- EC 14. Demonstrate knowledge of the citizen's opportunity to participate in political processes.
- EC 15. Demonstrate knowledge of important citizen rights and responsibilities.

Theme 6. Energy Alternatives

Sample Activity 6-1

Grade Level 11

RELATED ENVIRONMENTAL EDUCATION INSTRUCTIONAL GOALS AND/OR OBJECTIVES

- Students will support and practice wise utilization of traditional sources of energy and also support research and development of alternate energy sources. (Goal: pg. D2)
- Students will examine optional courses of action and their consequences for improving the quality of life and will support those that will provide optimum short- and long-term benefits for society and the environment. (Goal: pg. D38)

SOCIAL STUDIES INSTRUCTIONAL OBJECTIVES

- Identify and explain the development of Hawaii's economic history and its impact on the people. (Objective: pg. 47)
- Identify and explain the significant social, political and economic issues currently facing Hawaii's people. (Objective: pg. 47)

SUGGESTED MATERIALS AND/OR RESOURCES

1. Worksheet 6.1.
2. Reports on Alternate Energy Sources for Hawaii from HNEI (Hawaii Natural Energy Institute).
3. Speaker from HNEI.

Theme 6. Energy Alternatives

Sample Activity 6-1

Grade Level 11

ACTIVITY (Related Core Themes: 1, 3, 4, 5, 7, 9, 13, 14 & 15)

It has been estimated that in a few years, Hawaii will spend almost a billion dollars a year on oil. Fossil fuel products such as oil are escalating in price and have become an insecure source of energy. In the quest for self-sufficiency and the constraints of possible embargoes and other foreign actions and policies, the State of Hawaii has been a forerunner for a number of research and development projects regarding alternate, renewable sources of energy.

Not only will our venture into alternate renewable energy sources free us from the OPEC price increases but create new jobs, provide greater economic development and a better balance of trade. It has been projected that while alternate energy sources may achieve 100% electrical self-sufficiency, it cannot provide total self-sufficiency because the bulk of imported oil is used as jet fuel. However, the objective of the self-sufficiency plans for the year 2025 is for net self-sufficiency which is defined as the level where total energy production from indigenous sources is equal to total energy consumption, including jet fuel. What this really means is that while it is virtually impossible for Hawaii to become totally self-sufficient (i.e. no need for imported fuel) because of our need for jet fuel, it is possible to reach net self-sufficiency (where energy production equals energy consumption) by producing more than enough energy from indigenous sources and trading these for the needed fossil fuel.

In this activity, students will be asked to rank some alternative energy projects in order of their importance for receiving research and development funds. It is hoped that by learning something about each alternative energy project, the students will develop an understanding of the many factors involved in determining priorities for funding in energy research and development.

1. Discuss very briefly the various alternate energy programs here in Hawaii and elsewhere. Do not discuss the feasibility nor the cost/benefits.
2. Without doing any research, have students do Worksheet 6.1. Tell them to rank the various alternative methods of power generation based on what they've heard or read so far.
3. Compile the rankings on the board. Which method was considered most important by the class? Which was considered least important?
4. Assign students to study the various alternative methods of power generation and to find out more about the method. Tell them to consider the existing or available technologies and the economic, social, and environmental costs and benefits (advantages/disadvantages). Remind them that they are studying the feasibility of the project being done here in Hawaii.
5. Have students share their findings with the class and follow each report with a discussion on the importance of each method.

ACTIVITY (Cont'd.)

6. Have the class assume that they are members of the Congressional Appropriations Committee designated with the task of allocating "X" amount of dollars for energy research and development. Have them do Worksheet 6.1 again and rerank the various alternative methods of energy generation. Did their choices change? Why or why not?
7. Ask them to explain the title "Watt's The Alternative?" Discuss how Hawaii may possibly reach total electrical self-sufficiency and net self-sufficiency but not total self-sufficiency.

Worksheet 6.1

Sample Activity 6-1

Grade Level 11

"Watt's The Alternative?"

Directions: Below is a listing of alternative methods of electric power generation for Hawaii. Rank each method in order of its importance for receiving research and development funds. (1 = Most important; 9 = Least important.)

_____ Hydroelectric
_____ Biomass Conversion (bagasse, wood chips, etc.)
_____ Nuclear
_____ Waste Energy Recovery - Honolulu Program of Waste Energy Recovery (HPOWER)
_____ Coal
_____ Wind
_____ OTEC (Ocean Thermal Conversion)
_____ Solar
_____ Geothermal
_____ Other

Question: Which method did you consider as the most worthwhile (cost/effective) and why?

THEME 7. ENERGY STORAGE AND TRANSMISSION SYSTEMS

BACKGROUND

Theme 7 deals with the need for efficient systems to store available energy sources in a form that can be readily used and to transmit the energy to appropriate locations at a time when it is actually needed. The main purpose of these storage and transmission systems is to improve the efficiency of the flow of energy from the source to the consumer.

The efficient storage of energy in fossil fuels and readily available transport systems resulted in tremendous consumption of this energy source. However, as the limits of fossil fuels are being realized, modern technological societies must seek alternative energy sources. These resources have to be extracted, converted to a useful form, and stored until they are needed and used.

Some problems associated with the technology of improving storage to meet constantly increasing demands of consumers for more energy involve storage of large quantities of energy and the matching of intermittent sources with intermittent consumption.

This theme can help students to view the improvement of storage and transmission systems as an alternative energy source in the sense that increasing amounts of energy can be made available through more efficient use of current and/or future energy sources. It will also make them aware of the interaction of science and technology with the societal acceptance of solutions to energy-related problems.

FOUNDATION PROGRAM OBJECTIVES

FPO 1. Develop basic skills for learning and effective communication with others.
FPO 2. Develop positive self-concept.
FPO 3. Develop decision-making and problem-solving skills at the student's proficiency level.
FPO 4. Develop independence in learning.

CORE THEME OBJECTIVE

To know various energy storage and transmission systems.

Theme 7. Energy Storage and Transmission Systems

CONCEPTS

1. There are ethical, legal, aesthetic, social, political, economic, biological, and physical benefits and costs associated with energy storage and transmission systems.
2. Storage and transmission systems must be complementary to each other and appropriate to a given energy source.
3. In Hawaii, research of storage and transmission systems being done by the Hawaii Natural Energy Institute (HNEI) will lead to concepts useful in designing such systems.

RELATED GOALS AND/OR GENERAL OBJECTIVES OF SUBJECT AREA GUIDES

BASIC PRACTICAL ARTS: (pg. 4 - Objective) To effectively utilize the resources of our technological world and to understand the importance of conservation.

HOME ECONOMICS: (pg. iii - Objective) Perform the tasks of maintaining a home in such a way that will contribute effectively to furthering individual and family goals.

INDUSTRIAL ARTS/INDUS-TECH: (pg. 2 - Objective) Apply technical knowledge and techniques for effective living in situations such as recreation, consumption, occupation, and education.

MATHEMATICS: (pg. 13 - Goal) Develop understanding of the importance and relevance of mathematics historically and in the world today.

SCIENCE: (pg. A-13 - Objectives) 1. Foster the students' appreciation for the practical and aesthetic contribution of science to the improvement of quality of life and to promote in our students the desire to take an active part in that contribution. 2. Help students gain experience with the potentialities and limitations of the methods of scientific and social investigation but at the same time recognize that the environment can be interpreted and manipulated.

SOCIAL STUDIES: (pg. 11 - Objective) The student is able to participate actively and responsibly in collective decisions affecting the social, economic, political, or physical environment in which he or she lives.

Theme 7. Energy Storage and Transmission Systems

Subject Area SS

Grade Level 7-12

THINGS TO DO (Grade 7)

1. Explain how the imu was a form of an energy storage system. What kind of energy was stored? Where was it stored? Could all types of rocks be used? Demonstrate the workings of an imu to your classmates.
2. The ancient Hawaiians used the stored energy in kukui nuts to light their homes. Make a kukui nut candle and demonstrate how it works in class. Identify one way through which energy was transmitted in ancient Hawaii.

THINGS TO DO (Grade 8)

1. Explain how the energy stored in food is transferred to you for your use. What evidence do you have that food has energy? Think of a way to demonstrate this to a group of students.
2. Research and find out more about a fuel cell. How does it work? How does it differ from the storage batteries used today? Why is the fuel cell considered a useful way of storing energy?

THINGS TO DO (Grade 9)

1. Give examples of how people of different times and places stored energy for later use (i.e., the damming of water).
2. Give examples of energy stored in objects found around the home (e.g., the food we eat, a battery for a transistor radio, a yoyo, etc.). How is the energy being stored? How will it be used?

THINGS TO DO (Grade 10)

1. What are some of the storage and transmission problems encountered by various alternate energy sources? What storage and transmission systems have been suggested for each?
2. Find out how people got their energy before transmission lines became prevalent. Did the people themselves transport the energy? How did they store the energy?

THINGS TO DO (Grade 11)

1. Find out more about the use of submerged cables between the major islands as a means of transmitting electrical energy. Is it possible? Feasible? What are some of the problems? How would the environment be affected?

THINGS TO DO (Grade 11) (Cont'd.)

2. In Hawaii, electricity is transmitted through transmission lines--either overhead or underground. Which type of transmission line is more efficient? Reliable? Environmentally sound?

NOTE: Suggested activities could also be used by students taking related electives in grades 11 and 12.

VOCABULARY

Batteries, cost/benefit, efficiency, fuel cell, heat content, potential energy, storage, stored energy, transmission, submerged cables.

THEME 8. TRANSPORTATION

BACKGROUND

Theme 8 considers transportation in terms of the movement of goods and people. It also focuses on the enormous amounts of energy currently being used.

The transportation system in the United States uses about half of the nation's total consumption of petroleum. Being the greatest consumer of petroleum, it could also become the greatest conserver of energy. To do this, more efficient cars and trucks could be made, alternative ways to travel and move goods could be promoted, drivers could be taught to save gas, and other wasteful habits could be changed.

This theme should enable students to realize that the cost of energy continues to increase while the sources of petroleum energy dwindle. Alternative modes of transportation as well as trade-offs between transportation and communication systems must be considered. They should also be aware of the possible need for changes in personal values and lifestyles to accommodate various transportation modes.

FOUNDATION PROGRAM OBJECTIVES

FPO 1. Develop basic skills for learning and effective communication with others.
FPO 2. Develop positive self-concept.
FPO 3. Develop decision-making and problem-solving skills at the student's proficiency level.
FPO 4. Develop independence in learning.
FPO 5. Develop physical, social and emotional health.
FPO 6. Recognize and pursue career development as an integral part of growth and development.
FPO 7. Develop a continually growing philosophy such that the student is responsible to self as well as to others.

CORE THEME OBJECTIVE

To know a wide range of transportation modes and their energy resource requirements.

Theme 8. Transportation

CONCEPTS

1. One of the major users of energy is transportation.
2. Transportation modes should be appropriate to the needs of moving people and/or goods.
3. Transportation modes should be improved to make more efficient use of energy sources and have minimum negative effects on the environment.
4. Research of the potential of communications systems may help to relieve pressure on energy supplies used for transportation. It is far less costly to move information than to move people and things.
5. The Hawaii State Plan calls for an integrated multi-modal transportation system that services statewide needs and promotes the efficient, economical, safe and convenient movement of people and goods.

Theme 8. Transporation

RELATED GOALS AND/OR GENERAL OBJECTIVES OF SUBJECT AREA GUIDES

AGRICULTURE: (pg. 58 - Unit VI) Efficient processing, marketing, and distribution are essential in making agricultural products economically available to human.

ART: (pg. 7 - Objective) Demonstrate the application of necessary art skills and concepts by producing works of art in various modes of expression such as drawing, painting, ceramics, printmaking, weaving, sculpture and photography.

ASIAN, EUROPEAN AND PACIFIC LANGUAGES: (pg. 7 - Goal) A knowledge and understanding of the customs and mores of a society reflected in the student's behavior when living among the foreign group.

BASIC PRACTICAL ARTS: (pg. 4 - Objective) To develop an awareness of the needs of society for goods and services and how goods and services are effectively provided.

BUSINESS EDUCATION: (pg. V - Objective) To live effectively in today's economic environment.

HEALTH: (pg. iii - Goal) Through a developmental health education program, students will acquire accurate health information, and gain experiences contributing to attitudes, values and responsible health practices; students will be able to make decisions relating to their health and understand how these decisions affect them and the society in which they live.

INDUSTRIAL ARTS/INDUS-TECH: (pg. 2 - Objectives) 1. Develop an understanding of the principles, concepts, and problems of industrial technology. 2. Develop an understanding of the nature and significance of materials, tools, processes, products, and occupations of our technological world and their impact upon our society.

LANGUAGE ARTS: (pg. 4 - Goal) To increase student understanding of the nature and structure of the English language within the broad perspective of communication.

MATHEMATICS: (pg. 13 - Goal) Develop mathematical competence to function effectively in today's society.

SCIENCE: (pg. A-13 & 14 - Objectives) 1. Foster the students appreciation for the practical and aesthetic contribution of science to the improvement of quality of life and to promote in our students the desire to take an active part in that contribution. 2. Facilitate the students' ability to use scientific knowledge, processes, instruments and scientific language to clarify values, examine issues, solve problems in fulfilling personal, social and career life roles. 3. Help students gain experience with the potentialities and limitations of the methods of scientific and social investigation but at the same time recognize that the environment can be interpreted and manipulated.

SOCIAL STUDIES: (pg. 16 - Objectives) 1. The student is able to clarify value conflicts of communication problems which affect choices, decisions, or relationships. 2. The student is able to construct, evaluate, and revise alternatives for personal goals, plans or problems solutions, considering costs and benefits to self and to others affected by his or her decisions.

Theme 8. Transportation

Subject Area SS

Grade Level 7-12

THINGS TO DO (Grade 7)

1. Discuss the various modes of transportation used today. Find out which mode uses the most fossil fuel. Why? Can we cut down fossil fuel energy used by each mode equally? Why or why not? Participate in a debate and defend your position.

2. Propose a way in which domestic transportation could be used more efficiently. Share your ideas with your classmates. Are the proposals feasible? Enforceable? What are the advantages and disadvantages of each of your proposals?

3. Find out where bikeways and/or car pool lanes have been built on your island. Do you feel your community should have more? Why or why not? What are some arguments for and against bikeways? Car pool lanes? What energy costs are involved with the construction of bikeways or car pool lanes? What are the savings?

4. Look through the yellow pages and list all the businesses that are related to the automobile. If the automobile industry were to cut back production by 50%, which businesses would probably close? Which businesses would be affected if the automobile industries were to shut down completely? What other businesses might emerge? Why?

THINGS TO DO (Grade 8)

1. Describe what changes in your family's activities might occur if the automobiles could be used only from Mondays through Fridays? What changes might occur if there were no automobiles?

2. Write a paper discussing some of the jobs that would be affected and the uses of the "extra" energy made available if the principal mode of transportation for your town was limited to mass transit modes such as buses or trains.

3. Calculate the average miles per gallon for your parents' car for one week. Summarize and generalize on the efficiency of generic types (compacts, subcompacts, sedans, etc.). Compare your results with the EPA (Environmental Protection Agency) findings.

THINGS TO DO (Grade 9)

1. Conduct a survey to see how many people would be willing to use some other mode of transportation other than a car. Would they be willing to give up their car at least once a week?

THINGS TO DO (Grade 9) (Cont'd)

2. Study the modes of transportation used in various nations. Why do different nations use different transportation modes? Compare the different modes to energy consumed. Which modes are energy intensive? Which nations use at least 20% of the energy consumed in their country for transportation? Do the geographical and/or geological features of the land influence their transportation modes? Explain.

3. How would a reduction in gasoline production affect the auto industries? The national economy? How would international trade be affected? Invite a speaker from the Department of Energy, oil company, and the University of Hawaii to address these questions.

THINGS TO DO (Grade 10)

*1. Examine three (3) occasions when you rely on the automobile for transportation. Be creative and think of other modes of travel. What are the costs/benefits of other modes? (See Sample Activity 8-1. "Our Motorized Mistress")

2. Analyze the merits of various modes of transportation that might be used in an urban area and propose a transportation plan for the community.

3. Debate the resolution: "Each family should be restricted to one car."

4. Calculate the miles per gallon (mpg) and passenger miles per gallon (pmpg) for various modes of transportation. Which mode is the most efficient? Based on the costs and benefits, which would you choose? Why? (See Transportation and the City, Interdisciplinary Student/Teacher Materials in Energy, the Environment, and the Economy (EEE), Department of Energy, October, 1977.)

THINGS TO DO (Grade 11)

1. Find out about the modes of transportation used for interisland travel. How much energy is used daily by these modes? Is one mode more efficient than the others? What are the drawbacks of each mode? What other factors must be considered? Do you feel we should reduce interisland travel by 50%? Why or why not? Conduct a survey and find out how others feel about these questions.

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*For detailed description, see noted Sample Activity.

THINGS TO DO (Grade 11) (Cont'd.)

2. Write a paper explaining how geographic features have influenced our transportation system. How does transportation affect our lifestyle? Our energy use? How does the tourist industry affect our State's transportation use? Is this amount significant?

3. Propose a mass transit system for your island. Make or draw a map showing exactly where and how it should be developed. Is a mass transit system feasible for your island? Why or why not? If not, what kind of transportation system would you suggest for your island?

4. Investigate the air traffic in Hawaii. Break down your data into interisland, domestic, and international travel. What is the average annual passenger load in Hawaii for each type of travel? How much energy is involved annually? Monthly? Daily?

5. Debate the statement: "Only compact or subcompact cars should be allowed on our public highways." What are the implications for our auto industries? Our Economy? International trade? Law enforcement? Highway construction? City planning?

NOTE: Suggested activities could also be used by students taking related electives in grades 11 and 12.

VOCABULARY

Alternatives, bikeways, car, car pools, compact, transportation, trade-offs, conservation, efficiency, environmental impacts, mass transit, passenger miles per gallon, pollution, subcompact, transportation modes.

THEME 8. Transportation

Subject Area SS (BPA, Bus, H, Hec, IT, Sc)
Thematic Area EE, CE, G, LS, SA, VE
Grade Level 10

SAMPLE ACTIVITY 8-1. "Our Motorized Mistress"

OBJECTIVE

- To know a wide range of transportation modes and their energy resource requirements.

CONCEPTS

- One of the major users of energy is transportation.
- Transportation modes should be appropriate to the needs of moving people and/or goods.
- Transportation modes should be improved to make more efficient use of energy sources and have minimum negative effects on the environment.

ESSENTIAL COMPETENCIES

- EC 1. Read and use printed materials from daily life.
- EC 2. Complete commonly used forms.
- EC 3. Demonstrate writing skills commonly used in daily life.
- EC 4. Communicate orally in situations common to everyday life.
- EC 8. Reach reasoned solutions to commonly encountered problems.
- EC 10. Use resources for independent learning.
- EC 12. Identify training, skills and background requirements of at least one occupation in which the student is interested.
- EC 14. Demonstrate knowledge of the citizen's opportunity to participate in political processes.
- EC 15. Demonstrate knowledge of important citizen rights and responsibilities.

RELATED ENVIRONMENTAL EDUCATION INSTRUCTIONAL GOALS AND/OR OBJECTIVES

- Students will support and practice wise utilization of traditional sources of energy and also support research and development of alternate energy sources. (Goal: pg. D2)
- When faced with decisions concerning the use of earth resources, students will select practices developed in recognition of present and future environmental and human needs. (Goal: pg. D6)
- Students will examine optional courses of action and their consequences for improving the quality of life and will support those that will provide optimum short- and long-term benefits for society and the environment. (Goal: pg. D38)

Theme 8. Transportation

Sample Activity 8-1

Grade Level 10

SECONDARY SOCIAL STUDIES INSTRUCTIONAL OBJECTIVES

- Identify and explain the distinctive features that characterize the American nation today as seen through influences from the past. (Objective: pg. 38)
- Identify and explain alternative viewpoints, interests, and values, of a legal and political issue. (Objective: pg. 44)

SUGGESTED MATERIALS AND/OR RESOURCES

1. Transparency 8.1A and 8.1B.
2. Exercise 8.1.

Theme 8. Transportation

Sample Activity 8-1
Grade Level 10

ACTIVITY

The automobile seems to be one of the prime targets for conservation. Nationally, our "motorized mistress" uses 30 percent of our total oil supply and more than 12 percent of the nation's total energy. Locally, transportation accounts for 54.9 percent; the biggest user is air transportation which accounts for 27.4 percent. The automobile accounts for approximately 17 percent. (Statistics based on data from State Energy Office, 1976.)

Despite the fact that Hawaii motorists use only a fraction of the total energy consumed in Hawaii, conservation measures could provide a significant savings in our consumption of petroleum. Hawaii's unique situation of being geographically isolated and barren of but highly dependent on fossil fuels makes it imperative that conservation be practiced in all sectors of energy consumption.

In this activity students will weigh direct and indirect costs against benefits (tangible and intangible). Through this activity students may get a better idea of some of the alternatives one could consider and how decisions regarding the various choices, can be made.

1. Discuss with the students that transportation is one of the biggest users of oil products. Ask them to guess what percent of energy consumption in Hawaii is for transportation.
2. Make transparencies of the two pie charts and have students analyze the two charts. Point out that for Hawaii, the biggest bulk goes to jet fuel for our air transportation. Discuss the fact that Hawaii's geographic features, that of being an island state, necessitates import and export through air transportation. Also point out that because we are geologically relatively young there are virtually no fossil fuels on our islands and hence all of our petroleum is imported.
3. Discuss the energy consumption of the motorists in Hawaii as compared to the mainland United States. Why the difference? Why the large percentage for commercial and residential use? How are the problems associated with energy consumption similar for Hawaii and the mainland United States? How are they different? How about conservation in terms of transportation?
4. Ask students if they are willing to cut back on energy consumption? Ask them if they would be willing to cut back on their personal gasoline consumption? Have them do Exercise 8.1.
5. Discuss the questions from Exercise 8.1.

Theme 8. Transportation

Sample Activity 8-1

Grade Level 10

SUGGESTED FOLLOW-UP/ASSESSMENT ACTIVITIES

1. Write to various automobile companies to find out what they're doing to help cut down the depletion of our resources such as oil in a) production of the automobiles and b) in the design of the automobile itself.
2. Investigate the recent (last 5 years) federal laws and regulations regarding the automobile that have come about because of the energy shortage.

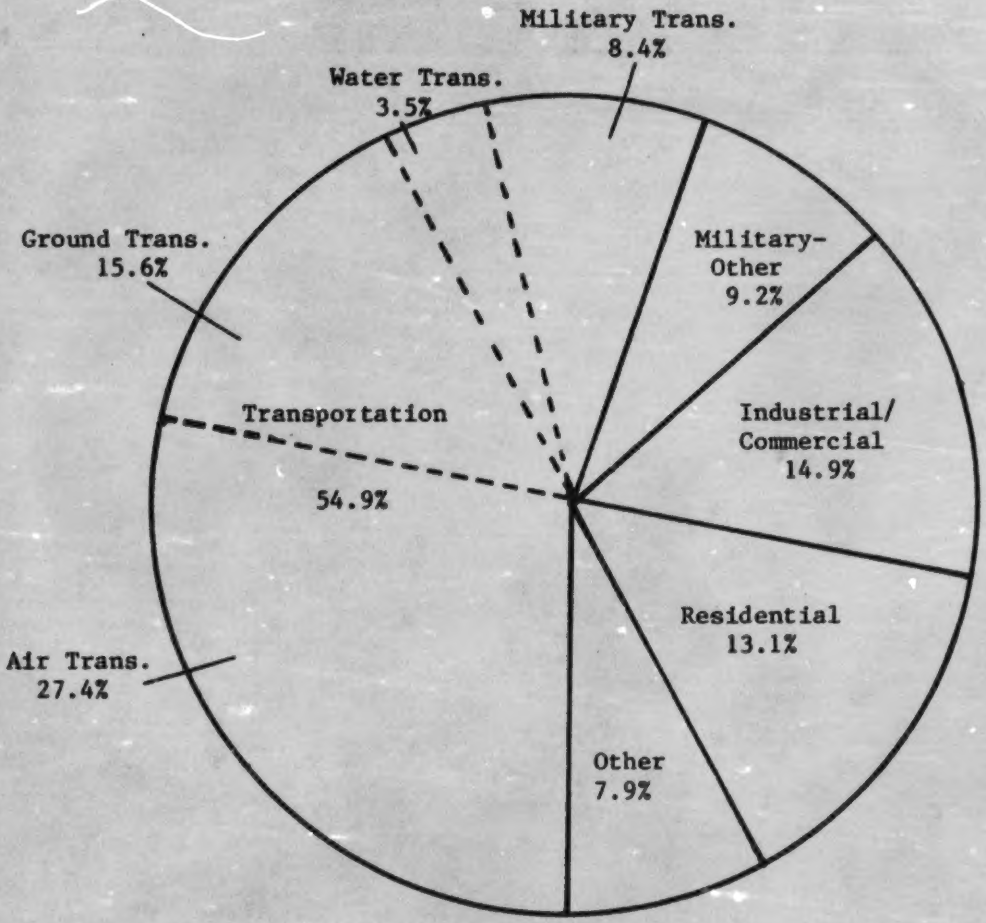
Theme 8. Transportation Sample Activity 8-1

Transparency 8.1A - Pie Chart II Grade Level 10

Hawaii Petroleum Consumption

By Economic Sector[1]

1976



39,624,192 Barrels Used

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[1] State Energy Office consultant unpublished report.

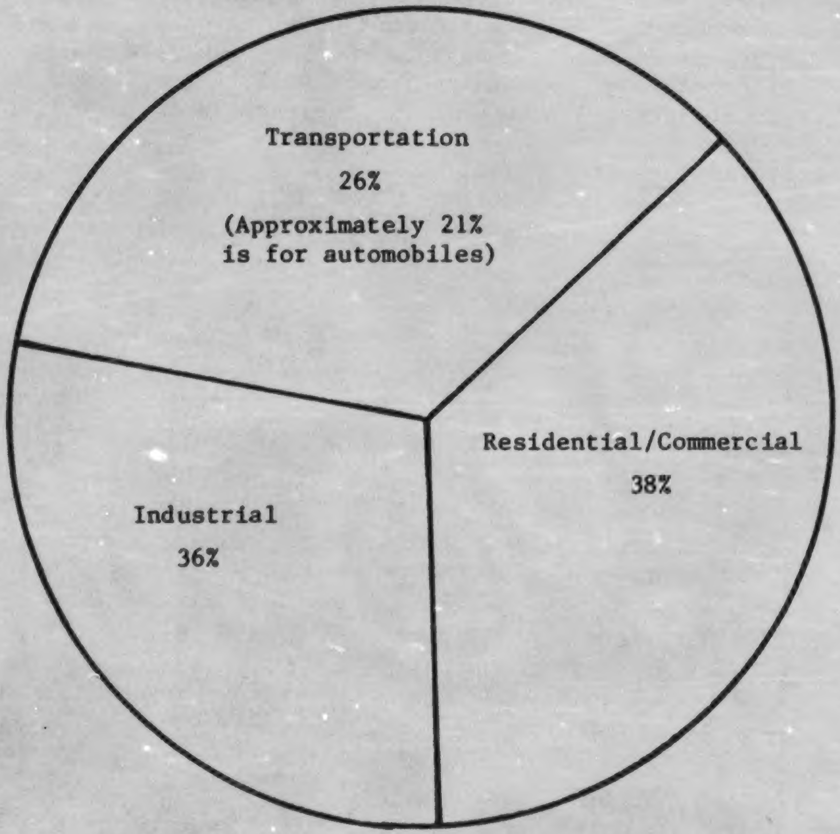
Theme 8. Transportation

Transparency 8.1B - Pie Chart II

Sample Activity 8-1

Grade Level 10

U. S. Energy Consumption By Sector, 1978[1]



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[1] Data taken from Energy Future. Report of the Energy Project at the Harvard Business School, Random House, New York, 1979, pg. 146.

Theme 8. Transportation Sample Activity 8-1

Exercise 8.1 Grade Level 10

"Our Motorized Mistress"

Directions:
1. Think of 3 occasions (for school, shopping, etc.) when you rely on the automobile as a means of transportation. List the 3 occasions under Part I in the spaces provided.
2. For each occasion, fill out the chart below. (See sample under Part I.) Three strategies are available to help you become more careful and creative in the ways you use natural resources: a) cut back on consumption; b) be more efficient users of resources; and c) use alternative means.
3. Research the cost of gasoline (regular, ethyl, etc.) in your community. What are the cost/benefits of using gasoline for various occasions? Consider the cost/benefits not only in financial but personal terms as well. Record your findings in the charts under Part I. (See sample in Part I.)

Part I: Transportation Use Strategies

SAMPLE

Occasion: Grocery Shopping
Frequency: Once a week or as needed

	Present Use of Gasoline	Strategy #1 Cutback	Strategy #2 Use more efficiently	Strategy #3 Find new means
Strategy Description		Plan ahead: Shop once a month	Car pool and shop with neighbor	Ride bicycle to shop
Type of fuel	Gasoline, ethyl	Gasoline, ethyl	Gasoline, ethyl	Muscle Power
Cost: (Direct and Indirect)	$.35/liter Wear and tear of car, etc.	$.35/liter Must plan	$ .35/liter Must plan and make arrangements	Initial cost of bike. Inconvenience. Able to carry only small amounts of groceries. Time and energy.
Benefits: (Direct and Indirect)	Saves time. Convenience, able to shop as goods are needed.	Saves money and gas, less wear and tear on car.	Saves money and gas, have chance to socialize with neighbor	Saves gas and money, healthy exercise, less air pollution

Theme 8. Transportation

Exercise 8.1 (Cont'd.)

Sample Activity 8-1

Grade Level 10

Occasion #1 ______________________

Frequency:

	Present Use of Gasoline	Strategy #1 Cutback	Strategy #2 Use more efficiently	Strategy #3 Find new means
Strategy Description				
Type of fuel				
Cost: (Direct and Indirect)				
Benefits: (Direct and Indirect)				

Theme 8. Transportation Sample Activity 8-1

Exercise 8.1 (Cont'd.) Grade Level 10

Occasion #2 ____________________

Frequency:

	Present Use of Gasoline	Strategy #1 Cutback	Strategy #2 Use more efficiently	Strategy #3 Find new means
Strategy Description				
Type of fuel				
Cost: (Direct and Indirect)				
Benefits: (Direct and Indirect)				

Theme 8. Transportation

Exercise 8.1 (Cont'd.)

Sample Activity 8-1

Grade Level 10

Occasion # 3 ______________________

Frequency:

	Present Use of Gasoline	Strategy #1 Cutback	Strategy #2 Use more efficiently	Strategy #3 Find new means
Strategy Description	X			
Type of fuel				
Cost: (Direct and Indirect)				
Benefits: (Direct and Indirect)				

Exercise 8.1 (Cont'd.)

PART II: Questions for discussion

1. Can you think of ways in which you could use gasoline more sparingly or avoid using it altogether?

2. Based on the costs/benefits that you recorded, which strategy is the best for each occasion? Did you choose the same strategy for each occasion? Why or why not?

3. Which strategy was most useful to you? Why? Were any of the alternatives you thought of unrealistic for you?

4. If gasoline was really in short supply such that consumption had to be cut back by 20%, would you be willing to use a mode of transportation other than a car such as a bus to do the family's grocery shopping? To get to a football or baseball game? To go out on a date?

5. In light of the energy shortage, what kinds of regulations should be legislated for future automobiles and motorists? List at least 3 and explain why it is an energy conservation measure.

6. How would the regulations suggested in question 5 affect future employment and/or careers?

7. For what other resources other than gasoline could you apply each of the three strategies?

THEME 9. ENVIRONMENTAL/ECOLOGICAL CONSIDERATIONS

BACKGROUND

The impacts of energy use on the environment are examined in Theme 9. These include the environmental damage resulting from the production, transportation and utilization of energy.

As energy consumption has increased, so has environmental pollution. In other words, environmental quality has been traded off for rapidly increasing demands for energy.

Various energy alternatives are being developed to meet energy demands as the shortage of fossil fuels is becoming more evident. Various energy sources have differing impacts on the environment while some uses of energy are more threatening than others to the environment. Therefore, advantages of a particular kind of energy extraction and/or use must be weighed against its effects on the environment.

Theme 9 will help to make students aware of the interrelationships among the principal variables of human ecology--population, organization, environment and technology which constitute an ecosystem. It will also help them to realize that every decision made involving energy alternatives affects the quality of life and must be considered in terms of their effects on the existing environmental and ecological conditions.

FOUNDATION PROGRAM OBJECTIVES

FPO 1. Develop basic skills for learning and effective communication with others.
FPO 2. Develop positive self-concept.
FPO 3. Develop decision-making and problem-solving skills at the student's proficiency level.
FPO 4. Develop independence in learning.
FPO 5. Develop physical, social and emotional health.
FPO 7. Develop a continually growing philosophy such that the student is responsible to self as well as to others.
FPO 8. Develop creative potential and aesthetic sensitivity.

CORE THEME OBJECTIVE

To know various energy options and their environmental/ecological benefits and consequences.

Theme 9. Environmental/Ecological Considerations

CONCEPTS

1. Energy extraction and use alter and/or pollute natural environmental conditions.
2. Trade-offs are necessary to resolve conflicts over energy use and the environment.
   a. A balance between short-term economic gains and long-term environmental quality involves trade-offs.
   b. The resolution of conflicts over conservation, land use, ecologically sound practices and aesthetic judgments involves trade-offs.
3. Political and cultural interest groups influence the decisions made regarding the development, use, and conservation of energy resources and their effects on the environment.
4. The Hawaii State plan states that the development or expansion of power systems and sources should adequately consider environmental, public health, and safety concerns and resource limitations.

Theme 9. Environmental/Ecological Considerations

RELATED GOALS AND/OR GENERAL OBJECTIVES OF SUBJECT AREA GUIDES

AGRICULTURE: (pg. 59 - Unit VII) Agriculture is faced with environmental problems that are both internal and external.

ART: (pg. 7 - Objective) Use the potentialities of art and take action to shape and enhance the quality of one's personal and public environment.

ASIAN, EUROPEAN AND PACIFIC LANGUAGES: (pg. 7 - Goal) A knowledge and understanding of the customs and mores of a society reflected in the student's behavior when living among the foreign group.

BASIC PRACTICAL ARTS: (pg. 4 - Objective) To effectively utilize the resources of our technological world and to understand the importance of conservation.

BUSINESS EDUCATION: (pg. V - Objective) To live effectively in today's economic environment.

HEALTH: (pg. iii & 1 - Goal) Through a developmental health education program, students will acquire accurate health information, and gain experiences contributing to attitudes, values and responsible health practices; students will be able to make decisions relating to their health and understand how these decisions affect them and the society in which they live.

HOME ECONOMICS: (pg. iii - Objective) Create a home and community environment conductive to the healthy growth and development of all members of the family at all stages of the family cycle.

INDUSTRIAL ARTS/INDUS-TECH: (pg. 2 - Objective) Develop an understanding of the nature and significance of materials, tools, processes, products, and occupations of our technological world, and their impact upon our society.

LANGUAGE ARTS: (pg. 4 - Goal) To assist students to develop the highest degree of informed control of which they are capable over their use of language.

MATHEMATICS: (pg. 13 - Goal) Nurture intellectual curiosity and promote the desire to continue learning.

MUSIC: (pg. 2 - Objective) Use musical skills in communicating ideas, thoughts and feelings.

PHYSICAL EDUCATION: (pg. 106 - Objective) Learn to respect the rights of others, help the less-skilled players, subordinate their own desires to the will of the group, and realize that they have the responsibility of directing their actions in behalf of the group.

SCIENCE: (pg. A-13 - Objectives) 1. Help students gain experience with the potentialities and limitations of the methods of scientific and social investigation but at the same time recognize that the environment can be interpreted and manipulated. 2. Encourage students to maintain a safe and healthy environment.

SOCIAL STUDIES: (pg. 11 - Objective) The student is able to participate actively and responsibly in collective decisions affecting the social, economic, political, or physical environment in which he or she lives.

Theme 9. Environmental/Ecological Considerations

Subject Area SS

Grade Level 7-12

THINGS TO DO (Grade 7)

*1. Show how the radical use or abuse of natural resources causes a break in nature's cycle. Can the cycle be mended? (See Sample Activity 9-1. "Breaking the Cycle")

2. Investigate and write a paper to support or refute the following statement: "Although the kapu and tabu systems were not meant to be conservation measures, they did in effect, keep the ecological and environmental systems in check."

3. Show the growth of environmental pollution as directly related to this economic growth. Use pictures and/or photographs to illustrate your relationship.

4. Discuss the effects of resource consumption in meeting basic needs duringthe pre-Cook era? What effects did it have on the environment? What happened to meeting basic needs after the arrival of Captain Cook and other westerners? How were the environment and ecology of Hawaii affected?

THINGS TO DO (Grade 8)

1. Simulate a court trial of the automobile. The charge is that the car has caused irreparable harm to people and the environment. Do you think the car is guilty or innocent? (See Transportation and the City, Interdisciplinary Student/Teacher Materials in Energy, the Environment, and the Economy (EEE), Department of Energy, October, 1977.)

2. Coal is currently being reconsidered as an energy alternative. Have a panel discussion on the pros and cons of coal as a fuel. What opportunity costs are involved?

3. Collect pictures from magazines that imply environmental pollution. What subtle hints are given that pollution is the topic of concern? Post your pictures on the bulletin board. You may want to make the bulletin board a learning center where other students can test their understanding.

THINGS TO DO (Grade 9)

1. Since land in Hawaii is so limited, careful planning must go into the zoning of land for various uses. What trade-offs must be considered in planning the use of land in light of a preferred future? Environment? What things are of value to the people of Hawaii? (See Sample Activity 9-2. "Land Use and Abuse")

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*For detailed description, refer to noted Sample Activity.

THINGS TO DO (Grade 9) (Cont'd.)

2. Many times, religious and other cultural practices make an impact on the environment. Find out how religious and/or cultural practices have influenced the preservation and/or devastation of the environment. How do these values and/or beliefs change over the years? Explain.

3. Conduct an in-depth investigation of a nation's (other than the U.S.) ecological/environmental problems. What caused the problems? Have they solved the problems? How? Are any of the problems associated with resource extraction? Explain. If the nation in question continues on its present course, what environmental/ecological problems and/or effects will there be 50 years from now?

4. Stage a World Organization meeting and discuss the trade-offs that all nations should consider to preserve our natural environment. Consider issues such as the killing of baby seals, slaughtering of the dolphins, harpooning of the whales, etc.

5. Find out what risks and dangers are involved with the extraction and transportation of oil. What are the environmental/ecological problems associated with oil production? (See Two Energy Gulfs, Interdisciplinary Student/Teacher Materials in Energy, the Environment and the Economy (EEE), Department of Energy, March, 1979.)

6. Write a paper discussing the physical effects on the ecosystem if fossil fuel were to be made available to people on an unlimited scale.

7. Select one environmental/ecological problem or concern. Use a cartoon character(s) to illustrate the problem or concern as faced by people who lived in different historical periods. Choose several historic periods such as the Middle Ages, Industrial Revolution, etc. Remember to change the clothing and environment whenever appropriate.

THINGS TO DO (Grade 10)

1. Examine the conflicting opinions underlying the controversy over strip-mining and open ranges. What are some of the environmental/ecological problems? What are the opportunity costs? Do the benefits outweigh the costs? (See Western Coal; Boom or Bust?, Interdisciplinary Student/Teacher Materials in Energy, the Environment, and the Economy (EEE), June, 1979.)

2. There are about one hundred million motor vehicles in the U.S. Most of the vehicles are for personal use. Write a law which restricts the auto to business use. Examine the benefits of such a law. What kinds of arguments do you anticipate from opponents of the law? How do other countries manage with only a limited number of automobiles?

THINGS TO DO (Grade 10) (Cont;d.)

3. Trace the beginnings of legislation controlling impacts made on the environment. Was energy a concern then?

4. Debate the resolution: "Non-returnable bottles and non-aluminum cans should not be allowed in school buildings."

5. Explain three (3) ways environmental/ecological situations relate to the following economic conditions: inflation, trade deficits, value of the American dollar, unemployment, and productivity.

THINGS TO DO (Grade 11)

*1. If you were a member of the city council, what criteria would you use in zoning land? Would aesthetics be a consideration? How about economics? (See Sample Activity 9-3. "Landscrape: The Price of Progress?")

2. Identify an ecological problem in the community and design a program to correct it.

3. Investigate the various environmental groups that exist in your community. Find out in what way their concerns are related to energy production and/or consumption. Invite a speaker from one of the groups to talk to your class. Be sure to invite groups representing more than one point of view.

4. Compare the environmental impact of various alternate energy sources currently being studied in Hawaii. Are the impacts on air and/or water quality or land use/abuse acceptable to environmental groups? Is aesthetics a consideration?

5. Find evidence of environmental/ecological changes for different areas on your island, e.g., Salt Lake, Honolulu. What kind of changes have occurred? Were the changes beneficial? Why or why not? If beneficial, to whom? If harmful, to whom or to what?

NOTE: Suggested activities could also be used by students taking related electives in grades 11 and 12.

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*For detailed description, refer to noted Sample Activity.

Subject Area	SS
Grade Level	7-12

VOCABULARY

Alternative, air quality, cause and effect, culture, ecology, environment, environmentalist, inflation, land use, legislation, opportunity cost, pollution, preferred future, productivity, quality control, special interest groups, strip-mining, trade deficits, trade-offs, value, water quality, zoning.

THEME 9. Environmental/Ecological Considerations

Subject Area SS (Ag, Bus, LA, Sc)
Thematic Area EE, G, LS, VE
Grade Level 7

SAMPLE ACTIVITY 9-1. "Breaking The Cycle"

OBJECTIVE

- To know various energy options and their environmental/ecological benefits and consequences.

CONCEPTS

- Energy extraction and use alter and/or pollute natural environmental conditions.
- Trade-offs are necessary to resolve conflicts over energy use and the environment.
  a. A balance between short-term economic gains and long-term environmental quality involves trade-offs.
  b. The resolution of conflicts over conservation, land use, ecologically sound practices and aesthetic judgments involves trade-offs.
- Political and cultural interest groups influence the decisions made regarding the development, use and conservation of energy resources and their effects on the environment.

ESSENTIAL COMPETENCIES

- EC 1. Read and use printed materials from daily life.
- EC 2. Complete commonly used forms.
- EC 3. Demonstrate writing skills commonly used in daily life.
- EC 4. Communicate orally in situations common to everyday life.
- EC 8. Reach reasoned solutions to commonly encountered problems.
- EC 10. Use resources for independent learning.
- EC 15. Demonstrate knowledge of important citizen rights and responsibilities.

RELATED ENVIRONMENTAL EDUCATION INSTRUCTIONAL GOALS AND/OR OBJECTIVES

- When faced with decisions concerning the use of earth resources, students will select practices developed in recognition of present and future environmental and human needs. (Goal: pg. D6)
- Students will demonstrate an appreciation for the interdependence of living things in the closed earth system. (Goal: pg. D30)
- Students will examine optional courses of action and their consequences for improving the quality of life and will support those that will provide optimum short- and long-term benefits for society and the environment. (Goal: pg. D38)

Theme 9. Environmental/Ecological Considerations

Sample Activity 9-1

Grade Level 7

SOCIAL STUDIES INSTRUCTIONAL OBJECTIVES

- Identify, describe, and explain the major periods and movements in Hawaiian history in the pre-modern era that influenced the growth and development of Hawaii. (Objective: pg. 25)
- Identify and describe the development of the social, political and economic institutions which evolved in pre-modern Hawaii. (Objective: pg. 25)

SUGGESTED MATERIALS AND/OR RESOURCES

1. Exercise 9.1.
2. Star Bulletin Article "Rape of the Sandalwood" by Peg and Russ Apple, January 4, 1972.

Theme 9. Environmental/Ecological Considerations

Sample Activity 9-1

Grade Level 7

ACTIVITY (Related Core Themes: 2, 3, 4, 5 & 13)

During the years 1778-1850 (often referred to as the Transitional Period), Hawaii moved away from a subsistence, agricultural economy to a trade-oriented, market economy.

Because of Hawaii's ideal location and its resources, trade ships made stopovers in the islands for renewal of food and supplies. The introduction of new plants and animals and the cutting down of the sandalwood trees, had severe ecological effects on Hawaii.

In this activity, students will attempt to show how our use and abuse of natural resources caused a break in nature's cycle.

1. Discuss what effects the coming of the Westerners had on the social system of ancient Hawaii. (Transitional Period 1778-1850)
2. Have students read how Hawaii's role in the sandalwood trade affected the resources of the islands. (See Exercise 9.1.)
3. Have the students describe some of the ecological effects that the introduction of new plants and animals had on island ecology.
4. Have the students draw some parallels regarding resource use and abuse during the transitional period and today. What are some of the common ecological/environmental effects?
5. How and why did the economy change from one of subsistence to one of a trade market?

SUGGESTED FOLLOW-UP/ASSESSMENT ACTIVITIES

The Ancient Hawaiians living on an island, probably had a stable population which survived in a subsistence economy. Research to find out how they cultivated the land and harvested the resources of the sea.

Theme 9. Evnrionmental/Ecological Considerations

Sample Activity 9-1

Grade Level 7

Exercise 9.1

Directions:
1. Read the article "The Rape of the Sandalwood" by Russ and Peg Apple on pages 167-168.
2. After reading the article, fill in the chart under Part I.
3. Next, answer the questions under Part II and be prepared to defend your answers.

PART I: Make a list of activities or events described in the article which were not common before the coming of Westerners. Describe the effect on the environment as described or implied by the article or through your own readings and research.

Activity/Event	Effect on Environment

PART II: Questions for discussion

1. Why did the Hawaiians begin growing European fruits and vegetables? What effect did this have on the environment? Was this contrary to their former life style of growing enough food for subsistence?

2. How did the Chinese use the sandalwood? What did the Hawaiians get in exchange for the sandalwood?

3. Why did the sandalwood trade come to an end? Do we have sandalwood in Hawaii today? What happened to the price of sandalwood? Is this similar to what's happening to the cost of dwindling oil today? Do you feel the benefits (new foods, wealth, etc.) reaped from the sale of the sandalwood out weighed the costs (people killed or getting sick from physical labor while hauling sandalwood, crops declining because not enough people tended the land, etc.)?

Theme 9. Environmental/Ecological Considerations

Sample Activity 9-1

Grade Level 7

The Rape of the Sandalwood[1]

by Russ and Peg Apple

Sandalwood time in Hawaii was a sad time. In the period from about 1790 through 1840 when Hawaii exported shipload after shipload of sandalwood these things happened --

- Hawaii's forests on all islands were almost depleted of one of Hawaii's native trees.
- Hawaii's commoners, who did the work of finding, cutting and hauling sandalwood for the chiefs, received little benefit.
- Hawaii's commoners spent so much time collecting sandalwood that gardens and fishing were neglected and starvation threatened many times during the period of 50 years.
- Hawaii's high chiefs, who sold the sandalwood to foreigners, received a lot of useless junk in exchange.
- Hawaii's high chiefs went into deep debt to foreigners.
- Hawaii's sandalwood trade destroyed the mutually beneficial relationship between the high chiefs and the commoners.
- Foreign traders did not always reap the rich rewards they anticipated from the trade.

King Kamehameha the Great, from 1790 through his death in 1819, as absolute monarch of the Kingdom of Hawaii he founded, held the royal monopoly on sandalwood.

As long as he ran the show, things were not so bad for the commoners. It was after his death, and the other chiefs were cut in, that troubles came to chiefs and commoners.

It was cash on the line with Kamehameha. No really "cash" in the form of silver and gold, although he did take some, but Western trade goods were what Kamehameha wanted.

And as Western goods were landed to go into Kamehameha's storehouses, sandalwood was loaded aboard.

All Kamehameha the Great had to do was send out the orders to fill the ship with sandalwood. With the ship went his personal agent, who told the high chief of whatever island he was dispatched to, to "fill her up."

The island or district high chief did so. It was his duty. It was also the duty of his people, the commoners under the foremanship of the lesser chiefs, to do the work and deliver the cut sandalwood to shipside.

It was Kamehameha the Great who got the goods in exchange. The island high chiefs, the lesser chiefs, and the commoners who did the work, got nothing material in exchange, and did not question the system. It was a new twist on a system used in Hawaii for perhaps a thousand years.

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[1] Reprinted with permission of the Honolulu Star-Bulletin, January 4, 1972.

"The Rape of the Sandalwood" (Cont'd.)

Through the time of Kamehameha, they received mostly benefits of a spiritual nature, and were glad of it. It was the job of ruling chiefs like Kamehameha to effect beneficial liaison with the major Polynesian gods. Commoners and lesser chiefs supported the ruling chiefs so they could do their main job--that of keeping the gods happy. Everybody benefitted.

Kamehameha obviously had the good will of the gods. They were on his side. They had helped him do something no other high chief had ever done, unite the numerous island chiefdoms into one master kingdom. During his lifetime, Kamehameha the Great held true to his gods. He also held onto the sandalwood monopoly.

Also true to his trust of seeing to the welfare of his people, when Kamehameha found that his sandalwood trade was taking his people away from gardens and sea, and that food was scarce, he immediately gave orders to lay off the sandalwood collection and pay attention to food production.

And in the conservation edict, Kamehameha the Great also put under kapu the sandalwood seedlings and very young trees so that there would be a future supply.

It was the Hawaiian version of "don't kill the goose that lays the golden egg."

So commoners got to eat enough, sufficient sandalwood was still gathered to swell the king's warehouses, and a future supply of sandalwood was assured under the rule of Kamehameha the Great.

But he died in 1819.

One of the deals that Kamehameha II, Liholiho, sacred son of Kamehameha the Great, made to get his crown and title, was to cut the high chiefs in on the sandalwood trade.

He gave up the royal monopoly to be acknowledged king and his father's rightful heir to the throne.

In 1819, the high chiefs wanted to accumulate Western goods for their own satisfaction. They had seen all the goodies Kamehameha the Great had acquired. They wanted some.

After 1819, there were a number of monopolies. Each high chief controlled land which grew sandalwood. Each high chief also had the organization and the commoners to collect it.

That was when things got nasty and rough on the commoners.

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THEME 9. Environmental/Ecological Considerations

Subject Area SS (LA, Sc)
Thematic Area EE, G, LS, VE
Grade Level 9

SAMPLE ACTIVITY 9-2. "Land Use and Abuse"

OBJECTIVE

- To know various energy options and their environmental/ecological benefits and consequences.

CONCEPTS

- Energy extraction and use alter and/or pollute natural environmental conditions.
- Trade-offs are necessary to resolve conflicts over energy use and the environment.
    a. A balance between short-term economic gains and long-term environmental quality involves trade-offs.
    b. The resolution of conflicts over conservation, land use, ecologically sound practices and aesthetic judgments involves trade-offs.
- Political and cultural interest groups influence the decisions made regarding the development, use, and conservation of energy resources and their effects on the environment.

ESSENTIAL COMPETENCIES

- EC 1. Read and use printed materials from daily life.
- EC 2. Complete commonly used forms.
- EC 3. Demonstrate writing skills commonly used in daily life.
- EC 4. Communicate orally in situations common to everyday life.
- EC 8. Reach reasoned solutions to commonly encountered problems.
- EC 10. Use resources for independent learning.

RELATED ENVIRONMENTAL EDUCATION INSTRUCTIONAL GOALS AND/OR OBJECTIVES

- When faced with decisions concerning the use of earth resources, students will select practices developed in recognition of present and future environmental and human needs. (Goal: pg. D6)
- Students will demonstrate an appreciation for the interdependence of living things in the closed earth system. (Goal: pg. D30)
- Students will examine optional courses of action and their consequences for improving the quality of life and will support those that will provide optimum short- and long-term benefits for society and the environment. (Goal: pg. D38)

SOCIAL STUDIES INSTRUCTIONAL OBJECTIVES

- Identify major philosophies, religions, and value systems that have influenced the lifestyle of different civilizations and cultures. (Objective: pg. 31)
- Define social change and explain how it has affected and influenced the lifestyle of people in various cultures. (Objective: pg. 31)

Theme 9. Environmental/Ecological Considerations

Sample Activity 9-2

Grade Level 9

SUGGESTED MATERIALS AND/OR RESOURCES

Worksheet 9.2.

Theme 9. Environmental/Ecological Considerations

Sample Activity 9-2

Grade Level 9

ACTIVITY (Related Core Themes: 5, 10 & 14)

We are becoming very sensitive and alert to the side effects of energy production and use. Problems such as air and water pollution and destruction of our natural beauties by processes such as strip mining are all by-products of energy production and use. Currently because of its abundance in our country, coal is now being considered as an alternate source of generating electricity. At present, Hawaii is exempt from having to convert from oil to coal for generating electricity. The shift from oil to coal involves opportunity costs. Opportunity costs refer to what must be sacrificed when decisions are made to use scarce productive resources to produce particular goods or services. One of the opportunity costs of building a coal-fueled electric generating plant may be clean air and the production of higher levels of CO_2 as waste products.

As future voting citizens, many questions and hard issues must be considered. Trade-offs must be considered in light of planning for a preferred future environment.

In this activity, students will try to find out more about some of the environmental problems that existed years ago.

1. Have students discuss what a safe, clean environment means to them. Discuss some current environmental problems.
2. Next have them fill out a "Value Inventory Sheet," worksheet.
3. Discuss the value inventory sheet but be careful not to make judgments. Do not force a student to discuss his/her answers if they don't want to.
4. Have students form groups to study when the first environmental issues and problems occurred in different parts of the world. For example, they could examine the lack of foresight in planning the location of Venice which is causing some pollution problems today; or learn about the population shifts in Ancient Rome which was one of the causes of the destruction of farmlands during the fall of the Empire; or have students read about various cultural beliefs and traditions that influence people's values and attitudes toward their environment. For example, find out how the Islamic religion influences the attitudes and values of its followers in regards to their environment.
5. Discuss with the students the relationship of energy production and use on the environment. Why is the problem today magnified? Did the problems exist 50 years ago? 100 years ago? Why or why not? What trade-offs are necessary regarding energy use, production and the environment?

Theme 9. Environmental/Ecological Considerations

Sample Activity 9-2

Grade Level 9

Worksheet 9.2

"Value Inventory Sheet"

Directions: This exercise is designed to give you some insight into your own values. There are no right or wrong answers.

PART I: Which do you consider to be the most important? Rank each item below. (Scale 1 = most important; 15 = least important.)

_____ Keeping our water supply pure

_____ Having clean air

_____ Reducing noise levels

_____ Understanding of ecology by the entire population

_____ Conserving of our natural resources

_____ Developing an environmentally-oriented lifestyle

_____ Eliminating litter

_____ Stabilizing population growth

_____ Refraining from using biocides (pesticides)

_____ Developing wise consumer practices

_____ Decreasing our energy consumption (electricity)

_____ Using land more rationally

_____ Lessening private and commercial solid waste production

_____ Controlling thermal pollution

_____ Sensitizing people to their surroundings (environmental awareness)

PART II: In order to continue the life style to which you are accustomed, it may be necessary for you to accept some of the following. In which order would you be accepting of the following items? Rank each item below. (1 = most easily acceptable; 5 = least easily acceptable.)

_____ having no more than 2 children

_____ living within a 10-mile radius of a nuclear power plant

_____ possibility of food contamination

_____ living next to a coal-fueled, electric generating plant

_____ possibility of water contamination

THEME 9. Environmental/Ecological Considerations

Subject Area SS (Ag, BPA, Bus, IT, LA)
Thematic Area EE, G, LS, VE
Grade Level 11

SAMPLE ACTIVITY 9-3. "Landscrape: The Price of Progress?"

OBJECTIVE

- To know various energy options and their environmental/ecological benefits and consequences.

CONCEPTS

- Energy extraction and use alter and/or pollute natural environmental conditions.
- Trade-offs are necessary to resolve conflicts over energy use and the environment.
  a. A balance between short-term economic gains and long-term environmental quality involves trade-offs.
  b. The resolution of conflicts over conservation, land use, ecologically sound practices and aesthetic judgments involves trade-offs.
- Political and cultural interest groups influence the decisions made regarding the development, use, and conservation of energy resources and their effects on the environment.
- The Hawaii State Plan states that the development or expansion of power systems and sources should adequately consider environmental, public health, and safety concerns and resource limitations.

ESSENTIAL COMPETENCIES

- EC 1. Read and use printed materials from daily life.
- EC 3. Demonstrate writing skills commonly used in daily life.
- EC 4. Communicate orally in situations common to everyday life.
- EC 8. Reach reasoned solutions to commonly encountered problems.
- EC 9. Distinguish fact from opinion in TV and radio news broadcasts, advertising, newspaper and magazine articles, and public speeches.
- EC 10. Use resources for independent learning.
- EC 13. Demonstrate knowledge of the basic structure and functions of national, state and local governments.
- EC 14. Demonstrate knowledge of the citizen's opportunities to participate in political processes.
- EC 15. Demonstrate knowledge of important citizen rights and responsibilities.

RELATED ENVIRONMENTAL EDUCATION INSTRUCTIONAL GOALS AND/OR OBJECTIVES

- When faced with decisions concerning the use of earth resources, students will select practices developed in recognition of present and future environmental and human needs.
- Students will demonstrate an appreciation for the interdependence of living things in the closed earth system. (Goal: pg. D30)
- Students will examine optional courses of action and their consequences for improving the quality of life and will support those that will provide optimum short- and long-term benefits for society and the environment. (Goal: pg. D38)

Theme 9. Environmental/Ecological Considerations

Sample Activity 9-3

Grade Level 11

SOCIAL STUDIES INSTRUCTIONAL OBJECTIVES

- Identify and explain the social and cultural backgrounds of the people of Hawaii today. (Objective: pg. 47)
- Identify and describe the political composition of Hawaii. (Objective: pg. 47)
- Identify and explain the significant social, political, and economic issues currently facing Hawaii's people. (Objective: pg. 47)

SUGGESTED MATERIALS AND/OR RESOURCES

1. Honolulu Star Bulletin article dated Friday, March 7, 1980: "Land Policy Bill Is Expected to Pass in House on Monday," or any current article or bill concerning land use.
2. Exercise 9.3.
3. Worksheets 9.3A and 9.3B.

174

Theme 9. Environmental/Ecological Considerations

Sample Activity 9-3

Grade Level 11

ACTIVITY (Related Core Themes: 4, 5, 10 & 13)

In all modern societies, a regulatory group usually exercises some control over the use an individual or group makes of land. There are many ways of modifying land...either for better or worse. Location and the physical characteristics of land and markets for the outputs of the land affect the value and use of land. Also, levels of technology available and the socio-cultural political values of groups influence land use.

Land means different things to different people. It may mean the space or surface on which life takes place and/or a location and/or a property and/or a capital and/or a factor of production in economic process.

Decisions made regarding alternative land uses directly influence the nature and quantity of energy resources available for use.

In this activity students will have hands-on experience making decisions regarding land use for the hypothetical city of Puka.

1. Discuss the concept of land use and abuse.
2. Ask students to take pictures or write a short report showing two examples of good land use and land abuse.
3. Have students share their findings.
4. Have students read the article "Land Policy Bill is Expected to Pass in House on Monday" (see page 177 of this module).
5. Discuss the article with the students, especially the various types of land mentioned.
6. After discussion have students do the simulation game found in Exercise 9.3.
   a. Divide the class into groups of 5-7. Try to get an uneven number of groups, (i.e. 5, 7, 9, etc.)
   b. Each group should represent various segments (e.g. industrial development, housing development, recreation, public service and utilities, education, commercial, environmental group, agriculture, tourist industry, etc.) of the community and should prepare a written proposal explaining how the land should be used (zoned). (See Worksheet 9.3A)
   c. Form a city council board by selecting one member of each group to serve as a member.
   d. Have the council decide how to conduct the upcoming meeting and to formulate a plan to evaluate each group's proposal. (See Worksheet 9.3B)
   e. At the city council hearing, allow each group 6-10 minutes to make their presentation. Allow five minutes for questions by council members and from the floor. After all reports are completed, have a recess and have the council reconvene and give its decisions and reasons for the decision. (NOTE: Assign someone to be the timer to keep the meeting running smoothly.)

ACTIVITY (Cont'd.)

7. Discuss the results of the simulation game and explain that hearings are similar to the one they've enacted; i.e. all groups do have a chance to voice their opinion.
8. Have students relate the Honolulu Star Bulletin article to the town of Kaiwi as detailed in the Simulation Game on Exercise 9.3 by writing a short discussion paper explaining how the revised land use would affect the town of Kaiwi. Ask them to include what they think Representative Ken Kiyabu's stand would be regarding the expansion of the city of Puka?
9. Have students write an essay relating land use to energy use and the environment.

SUGGESTED FOLLOW-UP/ASSESSMENT ACTIVITIES

Do a study of your town/city. Find out how the City and County government planned for the future of your town/city. Do you agree with the way your town/city was planned? Do you agree with the plans for its future? Make a model or a map of your town/city showing the stages of planning, i.e. past, present, and future plans.

"Land Policy Bill Is Expected to Pass in House on Monday"[1]

by Helen Altonn

A revised bill establishing Hawaii land use policies and priorities--viewed by its major author as a fulfillment of political promises to control growth--was expected to be reported out of two House committees today.

It seems certain to pass the full House on third reading Monday since more than half of the 51 members sit on the committees--State General Planning and Water, Land Use, Development and Hawaiian Affairs.

Resort and development executives, who oppose the measure, reportedly are already talking to senators in an attempt to stop it there.

They urged the House committees to kill the bill at a hearing Tuesday, saying it will prevent urban development which are already planned. Several state airport and housing projects also may be affected, said Hideto Kono, state planning and economic development director.

Representative Ken Kiyabu, who introduced the bill and chairs the General Planning Committee, stressed that he doesn't consider it anti-development. But, he said "This might be subject to argument."

The bill allows for essential economic development, he said, yet restricts it to certain areas and conditions.

Working together, Kiyabu's committee and the water and land use committee, headed by Representative Richard Kawakami, D-27th District, (Kauai-Niihau), have clarified and loosened up some areas of the bill to alleviate the concerns.

Shortly after it was typed up yesterday, Kiyabu said, "I feel comfortable... I think we took a giant step."

The new version enumerates statewide land use policies, taken from an administration bill to replace interim guidelines now used by the state Land Use Commission. The current guidelines will expire in May.

A second section establishes land use priorities--clearly designed to preserve agricultural lands and open spaces. Specific sites are listed throughout the Islands for agricultural, recreational and resort development.

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[1] Reprinted with permission of the Honolulu Star-Bulletin, March 7, 1980.

Theme 9. Environmental/Ecological Considerations

Sample Activity 9-3

Grade Level 11

"Land Policy Bill" (Cont'd.)

If there is a conflict in any area between permitted uses, agriculture will have first priority, recreation second, and tourism last, Kiyabu said.

And if there is any conflict between policies and priorities, the priorities will prevail, he said.

The bill retains a 100-yard shoreline setback requirement for new developments one of the most controversial items in the bill. And it mandates that public access be provided to beach lands.

Discussing the bill yesterday in an interview, Kiyabu, D-10th District (Kapahulu-Kaimuki), said: "Politicians and people running for office are always talking about preservation of agricultural and recreation lands and access to the beaches.

"We've got to do what we say. We have an obligation to future generations--not verbiage, but action."

"Some people call it controlled growth," he said. "But isn't that what people have been screaming about, from the governor on down?

"We are trying for a balance of public conerns," Kiyabu added. "It is incumbent upon us to take a stand, and do it now, or by the time we adopt the functional plans they won't have much meaning--only words."

The bill would plug the gap with land policy directions for state and county land planning agencies until state functional plans are adopted on agriculture, water, tourism, conservation and recreation.

It's doubtful whether the plans will move out of the Legislature this year.

Kiyabu is waiting for an opinion from the state attorney general concerning questions about the legality of the planning procedures.

He also wants to re-examine some of the plans to make sure they are consistent with the land use bill.

For example, the committees omitted Queen's Beach in Hawaii Kai for designated resort-condominium areas, putting it in the list of sites earmarked for recreation. So it also will have to be removed from the tourism plan, Kiyabu said.

The original land use bill had directed growth to the Neighbor Islands as a major policy. But this was protested by some counties and it has been dropped for a more general policy statement.

The committees also eliminated a requirement that agricultural land developments be limited to "marginal" agricultural lands because of problems in defining "marginal."

Agricultural lands classed as "prime," "unique," and "other important agricultural lands" would be confined to agriculture. But employee housing, farm buildings and other uses covered under the present law would be permitted.

"Land Policy Bill" (Cont'd.)

A small opening also is provided for other developments where planning agencies find that "a substantial injustice and inequaity will result" if they are denied.

However, the agencies would have to report such actions to the Legislature.

Kiyabu said the restrictions were softened slightly concerning developments on agricultural land because of the critical need for housing, which could go on non-productive farm lands.

The Bill protects agricultural parks from urban intrusion and, in a strategy to preserve water resources, allows developments only where water supplies are available and wouldn't be jeopardized.

Recreational areas named in the bill are tied to those covered by the 1975 state Comprehensive Outdoor Recreation Plan. Queen's Beach and Sand Island are included among the Oahu sites.

The committees also added some sites to the initial lists and subtracted others.

* * *

Theme 9. Environmental/Ecological Considerations

Sample Activity 9-3

Grade Level 11

Exercise 9.3 - Simulation Game

"Landscrape: The Price for Progress?"[1]

The Place:	Kaiwi is a small town on the island of Maunalua located south of the capital city of Puka. The town has a population of 5,000 and serves as the agricultural center of the island growing fruits and vegetables such as papaya, sugar cane, pineapple, taro and watercress. Located up along the mountainous hillside are rich pasturelands for cattle, goats, etc. The little town of Kaiwi is self-sufficient agriculturally. The Kaiwi river runs near the town and provides not only the island's potable water but also a source of irrigation water.
The Problem:	The capital city of Puka has a population of 50,000 which is rapidly increasing. There has been pressure to expand the city limits south to allow the city to grow. Pressure by various segments of the community has pressured the city council members to rezone 1,000 acres of this land for housing to provide for land for new residents and thus alleviate the housing problems brought about by immigration.
The Geography:	The city is located in a lush green valley with mountains to the south, east, and west. The Pacific Ocean borders it on the north. The town is slightly sloping and lies at the foot of steep mountains which have a history of rainfall throughout most of the year. There is thick vegetation on most of the slopes. Water while being supplied by the river is supplemented by a water reservoir. The soil is rich and fertile; the land is good for farming and grazing.
The Economy:	Farming has been the historical foundation of the city's economy but is becoming less and less a factor today. Small businesses such as a tuna packing plant, air transportation for tourism and a sugar mill have slowly evolved. Other industries are considering building factories in Puka as well as bringing more jobs and money into the economy.
The Citizens:	As a whole, the community seems to favor growth; however, the residents of Kaiwi are against rezoning. A core of citizens forming a group called "Citizens For Ecology" has started a movement within the community in hopes of preserving the scenic beauty of the region and are opposed to the development of the area for homes or industry.

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[1] Adapted from a lesson presented in Investigating Your Environment Series, U. S. Forest Service, San Francisco, California, 1972.

Sample Activity 9-3

Grade Level 11

Exercise 9.3 - Simulation Game (Cont'd.)

Your Assignment: As members of the community you are to attend a city council meeting to decide if rezoning should be approved. Before making a decision, decide what land use could occur on the land. Develop a plan of action and a presentation to be made to the city council. Use maps, drawings, charts, and/or graphs to support your proposal.

Theme 9. Environmental/Ecological Considerations

Worksheet 9.3A

Sample Activity 9-3

Grade Level 11

"Landscrape: The Price of Progress"

Directions:
1. Fill in the chart on Part I for your particular group. (Take 5-10 minutes.)
2. Plan a strategy and develop a 5-10 minute presentation for the City Council. (Take about 20 minutes.)

PART I: Analyze and list the possible consequences of different land uses within your assigned land use category and/or group.

Group or Category of Land Use: ______________________________

Use	Advantages to Land and/or People	Disadvantages to Land and/or People

PART II: Develop a strategy and prepare a presentation to be made to the city council.

A. The presentation should be a proposal for development and rezoning of the 1,000 acres of land in the city of Puka.

B. The presentation should include visual displays such as a map drawing and/or plans for the proposed use of the land.

C. Each member of your group should participate in some way during the presentation.

Theme 9. Environmental/Ecological Considerations
Sample Activity 9-3
Grade Level 11

Worksheet 9.3B

"Landscrape: The Price of Progress"

Worksheet for City Council Members

Directions:
1. Elect a chairman of the Council.
2. Develop the criteria needed to evaluate the various proposals. See example below.
3. After hearing each proposal, evaluate and rate them using the criteria decided on by the Council. Chairman of the Council should announce to each group the amount of time allowed for presentation, questions and rebuttal.
4. After hearing all the proposals, recess for 5-10 minutes to select the best proposal.
5. After the recess, announce your decision and give reasons for the Council's decision. (e.g. criteria used, etc.).

Sample Criteria Sheet:

Proposal	Criteria				
	Employment	Economic Growth	Safety to Community	Aesthetics, etc.	Additional Comments

THEME 10. ENERGY COST, RESPONSIBILITY AND PRIVILEGE

BACKGROUND

Theme 10 focuses on the role and responsibility of (1) energy suppliers, especially the oil industry, (2) public interest groups such as the environmentalists,(3) energy consumers which include individual citizens, commerce and industry, and (4) government in protecting the privilege of energy consumption and in determining policies on the availability and cost of energy. This theme also deals with the problems involved in meeting the demands for an adequate, reliable energy supply at the lowest possible cost that is consistent with necessary environmental quality safeguards.

Individuals can contribute to the solution of these problems by reducing energy waste through more responsible and efficient use of energy. It is the privilege as well as the responsibility of citizens in a free enterprise system to develop competence in making rational and appropriate decisions about their consumption of energy related goods and services. For example, energy consumers must consider the diminishing supply of fossil fuels and the rising cost of energy when making decisions on replacements or purchases of cars, appliances, homes, etc.

The private enterprise system can also make contributions to the solutions of energy-related problems. Employers can make energy conservation a high priority while businesses can develop better processes and practices to use energy more efficiently. In addition, oil industries can improve techniques for extracting and using energy as well as search for and develop other energy alternatives.

Research and development of energy alternatives should provide further relief to the problems of short supply and escalating costs of energy. This issue involves decision-making by citizens about the role of government in the research, development, financing, regulation, and ownership of alternate energy resources. It also involves the privilege and responsibility of oil industries and other energy suppliers to finance the research and development of present and future energy resources.

Understanding of this theme should enable students to realize the importance of an open and candid government and private enterprise system that has the responsibility to inform and enlighten the public about their energy-related policies and decisions. Wide public consumer support of and cooperation among government, commerce and industry are essential for continued economic prosperity and growth and the maintenance or improvement of our quality of life.

Theme 10. Energy Cost, Responsibility and Privilege

FOUNDATION PROGRAM OBJECTIVES

FPO 1. Develop basic skills for learning and effective communication with others.
FPO 2. Develop positive self-concept.
FPO 3. Develop decision-making and problem-solving skills at the student's proficiency level.
FPO 4. Develop independence in learning.
FPO 7. Develop a continually growing philosophy such that the student is responsible to self as well as to others.
FPO 8. Develop creative potential and aesthetic sensitivity.

CORE THEME OBJECTIVE

To understand the various energy cost/responsibility/privilege interrelationships.

CONCEPTS

1. Government at all levels has a critical role to play in guiding the course of energy production and use.
2. The key factors affecting the availability of energy supplies are national economic policies, environmental legislation, and funding for research and development of untapped and new sources of energy.
3. Business and industry have the privilege and responsibility for increasing energy production while developing new sources of energy to meet demands at the lowest possible costs.
4. Individual citizens have the privilege and responsibility to keep informed, make value judgments and take actions which protect their environment, encourage conservation, reduce demands for energy, and curtail energy costs.

185

THEME 10. Energy Cost, Responsibility and Privilege

RELATED GOALS AND/OR GENERAL OBJECTIVES OF SUBJECT AREA GUIDES

AGRICULTURE: (pg. 62 - Unit X) Capital is needed to start, maintain, and expand agricultural enterprises.

BASIC PRACTICAL ARTS: (pg. 4 - Objective) To effectively utilize the resources of our technological world and to understand the importance of conservation.

BUSINESS EDUCATION: (pg. V - Objective) To live effectively in today's economic environment.

HOME ECONOMICS: (pg. iii - Objective) Take an intelligent part in legislative and other social action programs which directly affect the welfare of individuals and families.

INDUSTRIAL ARTS/INDUS-TECH: (pg. 2 - Objective) Develop an understanding of the nature and significance of materials, tools, processes, products, and occupations of our technological world, and their impact upon our society.

LANGUAGE ARTS: (pg. 4 - Goal) To increase student understandings of the nature and structure of the English language within the broad perspective of communication.

MATHEMATICS: (pg. 13 - Goal) Develop ability to think critically and to solve problems.

PHYSICAL EDUCATION: (pg. 106 - Objective) Learn to respect the rights of others, help the less-skilled players, subordinate their own desires to the will of the group and realize they have the responsibility of directing their actions in behalf of the group.

SCIENCE: (pg. A-13 & 14 - Objectives) 1. Help students to analyze and snythesize holistically (using knowledge from various disciplines) in solving a problem. 2. Prepare the children for useful, effective citizenship in an increasingly complex and technological society by developing an interest in and a curiosity about the future both for themselves and for the civilization of which they are a part. 3. Teach science as a unified discipline intergrated and/or coordinated with other disciplines such as math, social studies, language arts, art, etc.

SOCIAL STUDIES: (pg. 11 - Objective) The student is able to construct, evaluate, and revise alternatives for personal goals, plans, or problem solutions, considering costs and benefits to self and to others affected by his or her decisions.

Theme 10. Energy Cost, Responsibility and Privilege

Subject Area SS

Grade Level 7-12

THINGS TO DO (Grade 7)

*1. In ancient Hawaii, natural resources were very limited. How did the lifestyle of ancient Hawaiians infuence the use and availability of resources? How did the shift of responsibility and privilege from a few (the Alii) to many (common people) affect resources? (See Sample Activity 10-1. "Reaping What We Sow")

2. How did the ancient kapu and tabu systems resemble the government regulations of today? How did they differ?

3. The ancient Hawaiians and other primitive cultures had and still have a command system; i.e., the rulers (Alii) decided when, how much, and what to produce. Should our government tell us what, how much, and when to use energy? Should they have sole control of the allocation of energy resources? Have a panel discussion to explore all points of view.

4. Comment on the following statement: "As more foreigners entered the land, and the tabu and kapu systems were abolished, the people of Hawaii felt freer but became less responsible and started to abuse their natural resources for foreign, imported goods." Do you feel this is true of the people today; i.e., as more rights and freedoms were granted to Americans, did they become less responsible? Discuss all points of view.

THINGS TO DO (Grade 8)

*1. As a private citizen, what would you do if you were told to cut back on your use of energy? What if each state had a given allocation of energy, would you be willing to do with less than your share so that the hospitals may have more? (See Sample Activity 10-2. "A Balancing Act")

2. What are some causes of fluctuations of energy costs? How is this related to responsibilities shared by government, private business, and the individual? Do you influence energy costs? Explain.

3. Pretend that a group of you were cast ashore on a deserted island that had limited resources. What rules would have to be made? How would you decide? Who would enforce them? What considerations would be necessary if you were stranded for an indefinite length of time? Compare this situation to the castaways on Gilligan's Island or to Robinson Crusoe. How are things similar? Different?

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*For detailed description, refer to noted Sample Activity.

THINGS TO DO (Grade 8) (Cont'd.)

4. Describe laws that you consider necessary to reduce energy use. Assume that you are a congressperson. Write a law which would reduce fuel consumption and be equitable to all sectors of society. Determine which consumers should receive first priority. What criteria did you use in making decisions to write the law?

THINGS TO DO (Grade 9)

1. Describe the various types of government rules/regulations that exist. What is government's responsibility to the people under the different rules/regulations? Are the purposes and functions of all governments basically the same? How are the rights and privileges of private citizens, businesses, and various interest groups expressed under various rules/regulations? What are the advantages and disadvantages of various government systems?

2. Conduct a summit meeting to discuss the need for major powers of the world to cooperate in the solution of dwindling energy resources and increasing consumption. Should nations who control the fossil fuel energy reserves be allowed to black mail other countries? Should a world organization be developed to coordinate the allocation, distribution, production, and consumption of energy? Why or why not? What are the implications of forming such an organization? Would the concept of world citizenship alleviate energy costs? Explain.

3. Discuss the ramifications if the Middle East refuses to sell oil (at any cost) to the United States. How will this affect industries? How will this affect our lifestyle? What should the American government do? What should our energy producing industries in America do? What role should the private citizen play and how will this affect energy costs?

THINGS TO DO (Grade 10)

*1. Analyze several energy conservation proposals in regards to feasibility, enforceability, and costs/benefits. Which proposal would you be willing to practice? (See Sample Activity 10-3. "A Promotion for Energy")

2. Identify the major factors that influence the passage and/or modification of energy legislation. (See How a Bill Becomes a Law to Conserve Energy, Interdisciplinary Student/Teacher Materials in Energy, the Environment, and the Economy (EEE), Department of Energy, October, 1977.)

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*For detailed description, refer to noted Sample Activity.

THINGS TO DO (Grade 10) (Cont'd.)

3. Observe and report on ways in which people's actions have affected or violated the rights of others. Do you consider the abuse of natural resources an infringement on human rights? How about the wasteful use of energy? Explain.

4. If a law was passed saying that no one under the age of 18 could drive or own a car, what kinds of problems do you foresee? Is this a sensible law? Could it be enforced? Do you feel that individual rights would be infinged upon? At what point are laws an infringement on individual rights? What about the responsibilities shared by all individuals? Do you feel that to alleviate the tight energy situation, the President and/or Congress should have the power and authority to pass legislation that will alter our lifestyle? If an 18 year old is willing to pay more for the gas, should he/she be allowed to drive the car? Own the car?

5. Debate the benefits and shortcomings of the following two approaches to solving the energy shortage problem:

   A) A system of rationing, legislation and government action to insure equitable distribution of scarce fuels, along with increasing production, and the developing alternate sources.

   B) A free market system using price increases for scarce fuels to dampen demand, stimulate increased production through new technology, and hasten the search for cheaper substitutes and alternate sources of energy.

THINGS TO DO (Grade 11)

*1. When searching for alternate solutions to energy problems, what trade-offs must be made? What role does government, industry, and the individual play concerning energy use and availability? (See Sample Activity 10-4. "What Price Energy?")

2. Discuss the pros and cons of government proposed policies for allocation of energy resources. Consider self-interest as compared to cooperation on individual, community, national, and international bases.

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*For detailed description, refer to noted Sample Activity.

THINGS TO DO (Grade 11) (Cont'd.)

3. Currently much research is being done on alternate energy costs. Who should carry the burden of costs involving research and development? Should this be the responsibility of government? Energy consuming industries? Energy producing industries? Who should monitor projects? What is the individual's role in research and development?

4. Study the various energy legislation. Is all of this legislation equitable to all sectors of society? What about the poor communities? Are provisions made for them? Are provisions made for various sectors of the community? Are these provisions fair?

5. There are many movements today to preserve our historic sites; e.g., save Kahoolawe, Waiahole/Waikane. What does this mean in terms of energy costs, responsibilities, and privileges? How do these movements affect land use and/or availability? How does limited land use affect energy production? Energy costs? What should government's role be? What is your role? Whose rights should be considered? What trade-offs may be necessary in resolving the issues/problems?

NOTE: Suggested activities may also be used by students taking related electives in grades 11 and 12.

VPCABULARY

Allocation of resources, attitude, behavior, cause and effect, cost/benefit, distribution, energy cost, free enterprise, laws, legislation, lifestyle, privilege, priority, research and development, responsibilities, rights, role, scarcity supply and demand, value.

THEME 10. Energy Cost, Responsibility and Privilege

Subject Area SS (LA)
Thematic Area EE (G, LS, VE)
Grade Level 7

SAMPLE ACTIVITY 10-1. "Reaping What We Sow"

OBJECTIVE

- To understand the various energy cost/responsibility/privilege interrelationships.

CONCEPTS

- Government at all levels has a critical role to play in guiding the course of energy production and use.
- Business and industry have the privilege and responsibility for increasing energy production while developing new sources of energy to meet demands at the lowest possible costs.
- Individual citizens have the privilege and responsibility to keep informed, make value judgments and take actions which protect their environment, encourage conservation, reduce demands for energy, and curtail energy costs.

ESSENTIAL COMPETENCIES

- EC 1. Read and use printed materials from daily life.
- EC 2. Complete commonly used forms.
- EC 3. Demonstrate writing skills commonly used in daily life.
- EC 4. Communicate orally in situations common to everyday life.
- EC 8. Reach reasoned solutions to commonly encountered problems.
- EC 10. Use resources for independent learning.
- EC 13. Demonstrate knowledge of the basic structure and functions of national, state and local governments.
- EC 14. Demonstrate knowledge of the citizen's opportunities to participate in political processes.
- EC 15. Demonstrate knowledge of important citizen rights and responsibilities.

RELATED ENVIRONMENTAL EDUCATION INSTRUCTIONAL GOALS AND/OR OBJECTIVES

- When faced with decisions concerning the use of earth resources, students will select practices developed in recognition of present and future environmental and human needs. (Goal: pg. D6)
- Students will examine optional courses of action and their consequences for improving the quality of life and will support those that will provide optimum short- and long-term benefits for society and the environment. (Goal: pg. D38)

Theme 10. Energy Cost, Responsibility and Privilege

Sample Activity 10-1

Grade Level 7

SOCIAL STUDIES INSTRUCTIONAL OBJECTIVES

- Identify the geographic features of Hawaii from a map and explain their effects on the lifestyle which developed in the island community.
- Identify and define the historical and cultural origins of Hawaii's people in pre-modern times.
- Identify and describe the development of the social, political and economic institutions which evolved in pre-modern Hawaii.
- Identify, describe, and explain the major periods and movements in Hawaiian history in the pre-modern era that influenced the growth and development of Hawaii.
- Identify and define the distinctive features that characterize Hawaii today (social, political, economic, religious, etc.) as seen through influences from the past.

SUGGESTED MATERIALS AND/OR RESOURCES

Exercise 10.1.

Theme 10. Energy Cost, Responsibility and Privilege

Sample Activity 10-1

Grade Level 7

ACTIVITY (Related Core Themes: 2, 3, 4, 5, 9, 13 & 15)

The scarcity of resources is not a new problem. The ancient Hawaiians had little natural resources and yet they developed a system of making maximum use of their scarce resources. The Hawaiian culture was very developed in many ways as evidenced by the highly efficient use of fish ponds to harvest seafoods.

Today, the scarcity is of another kind - that of fossil fuel energy resources. How will the people of today handle the problem? The early Hawaiian's problem of scarce resources was controlled to some degree by tabus and kapus. Today, the free enterprise system encourages everyone to make use of available resources. Should the United States allow the free enterprise system to continue or should they intervene and decide what and how much to produce? What should the role of private businesses be? Should energy costs be controlled?

In this activity, students will look at the life styles that influence the use and availability of resources and the shift of privilege and responsibility from a select few to many.

1. Discuss with students the life style of Ancient Hawaiians. Be sure to include in your discussion, the way the Hawaiians made use of their natural resources in order to survive. At this point the geographic features of the land could be discussed to show how the Hawaiians made good use of their land and other natural resources. (Discussion could include location of village; their knowledge of prevailing winds, rain showers, etc.; kinds of crops grown; kinds of tools used, etc.)
2. Next have students do Exercise 10.1.
3. Discuss questions from Exercise 10.1.

SUGGESTED FOLLOW-UP/ASSESSMENT ACTIVITIES

Do a research paper that traces the shift of rights and responsibilities from the Aliis to the common people of Hawaii. Include in your paper a discussion of the "costs and benefits" of this gradual shift.

Theme 10. Energy Cost, Responsibility and Privilege

Sample Activity 10-1

Exercise 10.1

Grade Level 7

PART I

Time Period	Kind of Energy Resources Available	Decisions on What and How Much to Produce	How Leaders Were Chosen	Role of Alii or Government	Role of Individual
Ancient Hawaii					
Monarchy					
Hawaii Today					

Exercise 10.1 (Cont'd.)

PART II: Questions for discussion

1. Compare the wants of the ancient Hawaiians and people today? Were their wants limited or unlimited?

2. Compare the resources available during different time periods. Were the resources put to efficient and wise use? Who owned the resources in ancient Hawaii? During the Monarchy? Today?

3. Who made the economic decisions (what to produce and how much to produce) in ancient Hawaii?

4. Based on what you found out, why was the ancient Hawaiian community similar to a command market system or a free enterprise system?

5. How has the degree of privilege and responsibility of the common people shifted over the ages?

6. To solve our problem of dwindling resources, would you be willing to be like the ancient Hawaiians and give our leaders (government) complete authority over the production, use and distribution of our energy resources? Why or why not?

7. As future voting citizens, you have the privilege of choice in electing your future leaders and voicing your opinion regarding energy production and use. What do you feel is your role and responsibility concerning the energy situation? What should government's role be? How about private industries, especially those producing energy resources?

THEME 10. Energy Cost, Responsibility and Privilege

Subject Area SS (BPA, Bus, LA, M

Thematic Area EE, G, SA, VE

Grade Level 8

SAMPLE ACTIVITY 10-2. "A Balancing Act"

OBJECTIVE

- To understand the various energy cost/responsibility/privilege interrelationships.

CONCEPTS

- Government at all levels has a critical role to play in guiding the course of energy production and use.
- The key factors affecting the availability of energy supplies are national economic policies, environmental legislation, and funding for research and development of untapped and new sources of energy.
- Business and industry have the privilege and responsibility for increasing energy production while developing new sources of energy to meet demands at the lowest possible costs.
- Individual citizens have the privilege and responsibility to keep informed, make value judgments and take actions which protect their environment, encourage conservation, reduce demands for energy, and curtail energy costs.

ESSENTIAL COMPETENCIES

- EC 3. Demonstrate writing skills commonly used in daily life.
- EC 4. Communicate orally in situations common to everyday life.
- EC 5. Use computational skills in situations common to everyday life.
- EC 8. Reach reasoned solutions to commonly encountered problems.
- EC 13. Demonstrate knowledge of the basic structure and functions of national, state and local governments.
- EC 14. Demonstrate knowledge of the citizen's opportunities to participate in political processes.
- EC 15. Demonstrate knowledge of important citizen rights and responsibilities.

RELATED ENVIRONMENTAL EDUCATION INSTRUCTIONAL GOALS AND/OR OBJECTIVES

- Students will support and practice wise utilization of traditional sources of energy and also support research and development of alternate energy sources. (Goal: pg. D2)
- When faced with decisions concerning the use of earth resources, students will select practices developed in recognition of present and future environmental and human needs. (Goal: pg. D6)
- Students will demonstrate an appreciation for the interdependence of living things in the closed earth system. (Goal: pg. D30)
- Students will examine optional courses of action and their consequences for improving the quality of life and will support those that will provide optimum short- and long-term benefits for society and the environment. (Goal: pg. D38)

Theme 10. Energy Cost, Responsibility
and Privilege

Sample Activity 10-2
Grade Level 8

SOCIAL STUDIES INSTRUCTIONAL OBJECTIVES

- Identify the major economic and consumer problems confronting American society today, describe and explain some probable causes and the effects on the nation and its people. (Objective: pg. 28)
- Identify significant personal problems confronting oneself today and possibly in the future. Describe and explain some probable causes and effects on the individual presently and in the future. (Objective: pg. 28)

SUGGESTED MATERIALS AND/OR RESOURCES

1. Exercise 10.2.
2. Poker chips or tokens.

ACTIVITY (Related Core Themes: 3, 4, 5, 9 & 15)

The decision to allocate our energy resources may result in a cost in convenience and/or economic benefits for various sectors of the community. One question is, "Who should get first priority?" If an effective, workable solution is to be reached, all groups of the community must be willing to make sacrifices and compromises in order to work cooperatively toward a balanced energy program.

In this activity, students will get a chance to role play various groups of a community and get involved in making decisions regarding allocation of scarce energy resources.

1. Discuss with students one of the implications of our dwindling resources. Ask them how they feel about it. What sector of the community should cut back? Who should have first priority?, etc.
2. Tell students that they will have a chance to make decisions regarding the allocation of our scarce resources in Exercise 10.2 by role playing various groups of a hypothetical community.
3. Assign students to roles in various groups; e.g. in the residential group, students can role play housewives, or the public service group some students could play doctors, school superintendent, etc. If more roles than students are available, use other roles such as Director of Transportation, pilots, bus drivers, etc., for the transportation sector. (See Exercise 10.2)
4. Have students read Exercise 10.2.
    a. Begin play by telling the students that the community has been affected by an energy crisis and that the community has been alloted only 90 units by the President of the United States.
    b. Have each group submit to you a written application for the amount of energy units they feel they must have for their operation. Remind groups that they are not to consult one another.
    c. After receiving the application, evaluate each one. They will probably total more than 90 units. Decide on an allocation for each group which is less than what they asked for but be sure to cut back on each group proportionately so they will all be "penalized" equally.
    d. Give each group poker chips or some other tokens equal in number to the energy units they were allocated.
    e. Next tell students they may make deals with other groups by having a representative from their group negotiate with representatives from another group. Poker chips or tokens may be traded at this time. There will be three negotiation periods, each one will be 5 minutes long, with a 3 minute recess period in between.

ACTIVITY (Cont'd.)

f. At the conclusion of negotiations, each group should evaluate their situation and summarize their results.

g. Have each group report on the following:
   1. how many energy units (poker chips or tokens) they got
   2. how they are going to use them
   3. what cuts, if any, they have to make
   4. The economic impact of these cuts on the community

h. After each group reports, discuss with the class the final outcome of the community. Were the best choices made? Why or why not? What motives were behind the choices? Would you change the outcome if you could? How? Would you be willing to change your lifestyle? How? Do you think the allocation of resources and a cutback on energy as presented here is possible for Hawaii?

SUGGESTED FOLLOW-UP/ASSESSMENT ACTIVITIES

Research and find out how recent energy shortages have affected Hawaii's economy and the community.

Theme 10. Energy Cost, Responsibility and Privilege

Sample Activity 10-2

Grade Level 8

Exercise 10.2

"A Balancing Act"[1]

Directions:

1. Ask your teacher for a role assignment.
2. After being assigned a role, study the groups, their energy needs, and possible ways to cut back on energy use.
3. Find out who the other members of your group are and as a group, decide what your energy needs are and submit a written application for energy units to your teacher. (NOTE: The entire community has been alloted only 90 energy units.) Do not discuss your need requirement with any other group.
4. Your teacher will evaluate your request and decide what your group will be allocated and will give you poker chips or tokens to represent the energy units.
5. After receiving your poker chips or tokens, choose a representative to negotiate with representatives from other groups to work out some transactions of compromise and trade. Poker chips or tokens may be exchanged at this time. You will be given three negotiation periods, each will be 5 minutes long with a 3 minute recess in between.
6. At the end of negotiations, assess your situation. How many energy units did you get? How are you going to use them? What cuts, if any, do you have to make? What will the economic impact of these cuts be on the community?

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[1] Adapted from an activity presented in Energy Activities, Grades 7-12, Raleigh, North Carolina, 1974, pp. 89-91.

Theme 10. Energy Cost, Responsibility and Privilege

Sample Activity 10-2

Grade Level 8

Exercise 10.2 (Cont'd.)

GROUPS

1. Transportation - Utilizes 45 energy units

Sea transportation	2 units
Private cars	12 units
Buses (Mass Transit)	3 units
Commercial trucking	3 units
School buses	3 units
City services and emergencies	4 units
Secondary (road maintenance)	2 units
Airlines (overseas)	18 units
Interisland airlines	2 units

Strategy Guidelines:

1. For every energy unit saved from private cars, a 1 energy unit gain for mass transit is required.
2. For each unit lost from school transportation or from mass transit, a 2-unit gain for private cars is required.

2. Residential - utilizes 20 energy units

Water heating (at 140°F)	7 units
Refrigeration	3 units
Cooking	3 units
Air conditioning	1 unit
TV	1 unit
Clothes drying	1 unit
Freezing	1 unit
Lighting, small appliances, etc.	3 units

Strategy Guidelines:

1. Mandatory cutbacks in usage can be ordered by the group; e.g., 1 unit of energy can be saved by lowering heat 10°F.
2. Other reductions can be carried out by installing new energy saving devices or by lowering service in specific categories or by enforcing interrupted service overall, e.g., using a solar heater saves 2 energy units but cost $4,000 and using a heat pump saves 1 unit at a cost of $1,000. Maximum savings for any reduction or new devices is 2 energy units.

3. Public Services - utilizes 15 units

Schools	5 units
Hospitals	3 units
Governmental facilities	3 units
Municipal services	4 units

Strategy Guidelines:

A savings of 1 energy unit in any service category will result in a proportional loss: e.g., a 1 unit loss to school will result in a 1/5 or 20% loss in service; e.g., 4 days of school per week instead of 5, or a cut in hours in a day.

Theme 10. Energy Cost, Responsibility and Privilege

Sample Activity 10-2

Grade Level 8

Exercise 10.2 - Groups (cont'd.)

4. Commercial - utilizes 10 units

Basic operating use to keep stores and offices open normal hours - 9:00 to 9:00 (1 unit = 1 operating hour)	6 units
Lighting for advertising	2 units
Miscellaneous (elevators, fans, air conditioners, etc.)	2 units

4. Industrial - utilizes 40 units

Large pineapple cannery which employs 500 people	10 units
Small tuna cannery which employs 50 people	5 units
Small sugar mill which employs 750 people	15 units
Small coral jewelry plant which employs 50 people	5 units
Small muumuu factory which employs 50 people	5 units

Strategy Guideline:

Two units may be saved through general conservation; beyond that, however, a loss of 1 unit of energy = 25 people unemployed.

THEME 10. Energy Cost, Responsibility and Privilege

Subject Area SS (BPA, Bus, LA, Sc)
Thematic Area EE, G, LS, SA, VE
Grade Level 10

SAMPLE ACTIVITY 10-3. "A Promotion For Energy"

OBJECTIVE

- To understand the various energy cost/responsibility/privilege interrelationships.

CONCEPTS

- Government at all levels has a critical role to play in guiding the course of energy production and use.
- The key factors affecting the availability of energy supplies are national economic policies, environmental legislation, and funding for research and development of untapped and new sources of energy.
- Business and industry have the privilege and responsibility for increasing energy production while developing new sources of energy to meet demands at the lowest possible costs.
- Individual citizens have the privilege and responsibility to keep informed, make value judgments and take actions which protect their environment, encourage conservation, reduce demands for energy, and curtail energy costs.

ESSENTIAL COMPETENCIES

- EC 1. Read and use printed materials from daily life.
- EC 3. Demonstrate writing skills commonly used in daily life.
- EC 4. Communicate orally in situations common to everyday life.
- EC 8. Reach reasoned solutions to commonly encountered problems.
- EC 9. Distinguish fact from opinion in TV and radio broadcasts, advertising, newspaper and magazine articles, and public speeches.
- EC 10. Use resources for independent learning.
- EC 13. Demonstrate knowledge of the basic structure and functions of national, state and local governments.
- EC 14. Demonstrate knowledge of the citizen's opportunities to participate in political processes.
- EC 15. Demonstrate knowledge of important citizen rights and responsibilities.

RELATED ENVIRONMENTAL EDUCATION INSTRUCTIONAL GOALS AND/OR OBJECTIVES

- Students will support and practice wise utilization of traditional sources of energy and also support research and development of alternate energy sources. (Goal: pg. D2)
- When faced with decisions concerning the use of earth resources, students will select practices developed in recognition of present and future environmental and human needs. (Goal: pg. D6)
- Students will examine optional courses of action and their consequences for improving the quality of life and will support those that will provide optimum short- and long-term benefits for society and the environment. (Goal: pg. D38)

Theme 10. Energy Cost, Responsibility and Privilege

Sample Activity 10-3

Grade Level 10

SOCIAL STUDIES INSTRUCTIONAL OBJECTIVES

- Explain the nature and function of law and its impact on people's lives. (Objective: pg. 44)
- Identify and explain the process of making and changing laws and the role of the people in this process. (Objective: pg. 44)
- Identify and explain alternative viewpoints, interests, and values of a legal and political issue. (Objective: pg. 44)

SUGGESTED MATERIALS AND/OR RESOURCES

Exercise 10.3.

ACTIVITY (Related Core Themes: 3, 4, 5, 6, 9, 13 & 15)

Americans have been inundated with "energy proposals" by various sectors of the community; each group trying to promote their viewpoint. There are proposals by industry, unions, political parties, Administration, Congress and consumer groups. As citizens of a democratic nation, we have the responsibility to analyze and evaluate these proposals.

In this activity, students will analyze some energy conservation proposals and should be encouraged to develop their own analytical methods for evaluating proposals.

1. Review with students the 20 proposals listed in Exercise 10.3 and point out to them that these energy proposals all deal with an economic problem - a problem of supply and demand - and therefore deal with production and distribution. How can we produce more energy? Who gets to use the energy?
2. Ask them to share with the class any other proposals that they may have.
3. Divide the class into groups and have them choose one of the proposals listed in Exercise 10.3.
4. Ask each group to analyze one proposal. Tell them that there are Sample Analysis Questions in the Exercise to assist them when they analyze the proposals but also encourage them to come up with methods of their own.
5. Have students present their analysis of the proposal to the class. Allow time after each presentation for questions from the floor.
6. Have students write a proposal of their own and to present it to the class in some form (i.e., skit, television advertisement, etc.) to promote the acceptance of their proposal.

SUGGESTED FOLLOW-UP/ASSESSMENT ACTIVITIES

1. Draft a proposal that you feel should be adopted by the State of Hawaii and send it to the members of the State Legislature, the mayors and the Governor.
2. Analyze other proposals made by various groups such as labor unions, industries, etc.

Theme 10. Energy Cost, Responsibility and Privilege

Sample Activity 10-3

Grade Level 10

Exercise 10.3

"A Promotion for Energy"

Directions: From the proposals in this exercise, select one and analyze it using the questions below as a guide.

Sample Analysis Questions:

1. What parts of the proposal concern production problems?
    a. Does the proposal rely on market mechanisms or command mechanisms to solve production problems?
    b. How does the proposal encourage the production of more energy?
    c. Does the proposal encourage efficiency (high productivity) in the energy field?
    d. What are the opportunity costs of implementing this production proposal?
    e. What would be the impact of this proposal on the environment?
2. How does the proposal deal with the distribution of energy?
    a. Which groups will be helped by the proposal? Which groups will be hurt by the proposal?
    b. Will sacrifices in energy consumption have to be made? Are these sacrifices to be borne equally? If there are no sacrifices, will the plan work?
    c. What methods are employed to encourage the more efficient use of energy?
3. Is there economic or historical evidence that each point in the proposal can work? Can the proposal be easily enforced?
4. Does the proposal appeal to rational thought, or is it filled with emotionalism and/or demagoguery? How practical is the proposal?
5. Does the proposal affect the consumer's life style?
    a. What personal sacrifices must be made if the proposal is adopted?
    b. Does the proposal suggest that the consumer must agree to accept higher levels of pollution.

Proposals:

1. Increase the price of gasoline by 50 cents a gallon to cut down on gasoline use.
2. Increase the age at which a person can get a driver's license from 15 to 18.
3. Lower air pollution standards so industries can burn high sulfur coal rather than oil or natural gas.
4. Ban all students from driving to school if bus transportation is available.

Exercise 10.3 (Cont'd.)

5. Ban all driving of private cars on Sunday.
6. Ration gasoline so every driver can obtain only a certain amount.
7. Ban the use of recreational vehicles such as campers, minibikes, snowmobiles, and pleasure motorboats.
8. Reduce city streetlights by at least 25 percent.
9. Ban auto racing to save fuel.
10. Ban the use of all non-essential household appliances such as electric garage-door openers, electric can openers, color TV's, electric toothbrushes, garbage disposals, blenders, and stereo systems.
11. Limit each household to one television set.
12. Limit each household to one car.
13. Double the price of electricity and natural gas to discourage household use.
14. Ban the use of air conditioners in all buildings with windows.
15. Reduce oil imports by 20 percent.
16. Reduce oil and natural gas supplies to all industries by 20 percent.
17. Lower pollution standards on new cars so they can get better mileage.
18. Control the growth of population by charging large families higher taxes.
19. Make it mandatory that all new homes install a solar water heater.
20. Mandate that all recreational sports events (football, baseball, etc.) must be played during daylight hours.

THEME 10. Energy Cost, Responsibility and Privilege

Subject Area SS (Ag, BE, LA)
Thematic Area EE, CE, LS, VE
Grade Level 11

SAMPLE ACTIVITY 10-4 "What Price Energy?"

OBJECTIVE

- To understand the various energy cost/responsibility/privilege interrelationships.

CONCEPTS

- Government at all levels has a critical role to play in guiding the course of energy production and use.
- The key factors affecting the availability of energy supplies are national economic policies, environmental legislation, and funding for research and development of untapped and new sources of energy.
- Business and industry have the privilege and responsibility for increasing energy production while developing new sources of energy to meet demands at the lowest possible costs.
- Individual citizens have the privilege and responsibility to keep informed, make value judgments and take actions which protect their environment, encourage conservation, reduce demands for energy, and curtail energy costs.

ESSENTIAL COMPETENCIES

- EC 1. Read and use printed materials from daily life.
- EC 3. Demonstrate writing skills commonly used in daily life.
- EC 4. Communicate orally in situations common to everyday life.
- EC 8. Reach reasoned solutions to commonly encountered problems.
- EC 10. Use resources for independent learning.
- EC 12. Identify the harmful effects of smoking, drinking, drug abuse, overeating, insufficient sleep, poor personal hygiene, and poor nutrition.
- EC 13. Demonstrate knowledge of the basic structure and functions of national, state and local governments.
- EC 14. Demonstrate knowledge of the citizen's opportunities to participate in political processes.
- EC 15. Demonstrate knowledge of important citizen rights and responsibilities.

RELATED ENVIRONMENTAL EDUCATION INSTRUCTIONAL GOALS AND/OR OBJECTIVES

- When faced with decisions concerning the use of earth resources, students will select practices developed in recognition of present and future environmental and human needs. (Goal: pg. D6)
- Students will examine optional courses of action and their consequences for improving the quality of life and will support those that will provide optimum short- and long-term benefits for society and the environment. (Goal: pg. D38)

Theme 10. Energy Cost, Responsibility and Privilege

Sample Activity 10-4

Grade Level 11

SOCIAL STUDIES INSTRUCTIONAL OBJECTIVES

- Identify and explain the social and cultural backgrounds of the people of Hawaii today. (Objective: pg. 47)
- Identify and describe the development of a democratic heritage in the political, social, and economic life of Hawaii's citizens. (Objective: pg. 47)
- Identify and explain the development of Hawaii's economic history and its impact on the people. (Objective: pg. 47)
- Identify and explain the significant social, political and economic issues currently facing Hawaii's people. (Objective: pg. 47)

SUGGESTED MATERIALS AND/OR RESOURCES

Exercise 10.4. A Case Study: "The Sell Out."

Sample Activity 10-4

Grade Level 11

ACTIVITY (Related Core Themes: 3, 5, 6 & 15)

While it is true that research and development of alternative sources of energy would provide some relief to the problems of short supply and escalating costs of energy, some questions still remain unanswered. Who should do the research and development? Should it be the energy-related industries, private businesses or the government? Should it be a combination of the three? What role does the government have in terms of financing research and development? What are some of the problems? What should the attitude of private citizens be toward research and development? Should citizens be willing to sacrifice their lifestyles and/or beliefs and/or values in our nation's effort to alleviate the energy crunch?

In this activity the students get to look at some of these questions by looking at a hypothetical case study.

1. Discuss with students the role government plays in the solution of our energy problems. What are the responsibilities of private citizens? Oil companies? Private industries?
2. Divide the class into small groups and have them do Exercise 10.2. Have them select a recorder and chairperson and at the end of the class period report their responses to the discussion questions. Ask them to respond to only one viewpoint based on the groups' consensus.
3. Discuss groups' responses.
4. Assign groups to do a follow-up by investigating the current status of various energy options mentioned here and elsewhere such as OTEC, aquaculture, geothermal energy, etc. Have them report their findings.
5. After the class hears all the reports on various energy alternatives, have them discuss and decide which one or ones would be most cost-effective for Mrs. Kama's farm land.

SUGGESTED FOLLOW-UP/ASSESSMENT ACTIVITIES

Using this case study, have a jury and judge decide the outcome of whether Mrs. Kama should be forced to sell and to whom. If needed, a model format is found in Sample Activity 3-3. "A Case of Erg-ency" in the Energy and the Environment Secondary Language Arts Module.

Theme 10. Energy Cost, Responsibility and Privilege

Sample Activity 10-4

Grade Level 11

Exercise 10.4

A CASE STUDY: "The Sell Out"

SITE: A small town on the island of Hawi.

LOCATION: A small farm on the outskirts of the town.

HISTORY:

The people living in the small town on the island of Hawi have lived there for many generations. The area was once a thriving pineapple plantation town. Today most of the younger generation have left the town and only a handful of people reside there. On the outskirts of the town is a small papaya farm. Only a single 75 years old widow, Mrs. Kama, resides on the farm in question. She is the great granddaughter of the original owner who was also the founder of the town. Mrs. Kama cares little for farming as a way of life but has a strong religious reverence for the land of her ancestors. Several ancestral members are buried on the farm.

The farm land in question sits on a geologic rift zone and is flat, and fertile. It is bordered on the north end by 2 large ponds, the west side by the Pacific Ocean, the south end by a little hill, and the east side by the mountain.

Offers to buy the farm have been made by various groups including: 1) a power company interested in building a geothermal plant there and possibly an OTEC plant; 2) an aquaculture corporation interested in raising prawns and oysters on the farm; and 3) a private amusement company from the West Coast interested in building a miniature "Disneyland" type of amusement park. All three offers will bring increased business to the town and to the island as a whole. Offers from the power company and the aquaculture farmers might even help bring the island of Hawi closer to their goal of energy self-sufficiency. During surveys done by the power company, island artifacts have been found. However in attempting to buy the land, the power company denied this story.

Currently, the owner, Mrs. Kama, does not want to sell. However, if she refuses, the state has informed her that they will condemn her land, buy it and sell it to the power company.

Exercise 10.4 (Cont'd.)

Questions for discussion:

1. Does an individual have the right to refuse to sell his/her land?

2. Should land be used for "national/state needs" as opposed to "personal needs"? Where does one draw the line between one's responsibility to our country/state and our personal beliefs? Where does "national/state needs" supercede "personal needs"?

3. Does the power company have the responsibility to be completely honest about their finding of island artifacts? Should the power company be allowed to use the farm land for purposes other than what was stated?

4. If you were president of the power company, would you insist on obtaining the ancestral home from a 75 year old widow who believes that the land she lives on is sacred?

5. If Mrs. Kama decides to sell her land, who should she sell it to? Why?

6. Should the government have the right to tell Mrs. Kama who should get the land should she decide to sell? Why?

7. What responsibilities do a) private citizens, b) private industries such as power companies, and c) government have regarding the research and development of untapped and new sources of energy.

8. What does the title "The Sell Out" mean?

9. How does the writer of this case study feel about this dilemma? Support your answer.

10. What is eminent domain? What government rights are guaranteed by it? How about the right of Mrs. Kama in having her land preserved because of the artifacts? Is there a law that protects her rights?

11. If our country was in dire need of new sources of energy, would you influence Mrs. Kama to sell? Why or why not?

THEME 11. ENERGY VS. POPULATION VS. FOOD

BACKGROUND

Theme 11 deals with population density as a factor which influences the exploitation of an area's natural resources and thus the availability of the energy resources in that area. It also considers the effects of population changes on supplies of and the demands for energy and food. For example, an increase in population results in greater demands for food production. Then, as food production is increased more energy is used. The earth's resources are limited, however, and can support only a limited population.

It should be noted that food production can be viewed as both a source and a user of energy. As an energy source, food provides human beings with fuel for their bodies. As an energy user, food production requires energy.

Understanding of the various energy/population/food interrelationships should enable students to appreciate energy as the key link to life. It should also help them to realize that the earth's resources are finite and, even with optimum recycling systems, can support only a limited population. This understanding should also encourage students to adopt values and practices based on the wise and judicious use of energy and food.

FOUNDATION PROGRAM OBJECTIVES

FPO 1. Develop basic skills for learning and effective communication with others.
FPO 2. Develop positive self-concept.
FPO 3. Develop decision-making and problem-solving skills at the student's proficiency level.
FPO 4. Develop independence in learning.
FPO 5. Develop physical, social and emotional health.
FPO 6. Recognize and pursue career development as an integral part of growth and development.
FPO 7. Develop a continually growing philosophy such that the student is responsible to self as well as to others.

CORE THEME OBJECTIVE

To understand the various energy/population/food interrelationships.

Theme 11. Energy vs. Population vs. Food

CONCEPTS

1. Population changes directly influence energy demands, availability and supply.
2. Population density of an area may influence the demand for and possible use patterns of energy resources.
3. Population changes directly influence food consumption and supply.
4. Food production requires tremendous amounts of energy and money.
5. The use of Hawaii's limited prime agricultural land resources is being directed towards trying to achieve self-sufficiency in food production.
6. Hawaii's policy on population is to manage population growth rates throughout the state consistent with available and planned energy resources.

RELATED GOALS AND/OR GENERAL OBJECTIVES OF SUBJECT AREA GUIDES

AGRICULTURE: (pg. 59 - Unit VII) Agriculture is faced with environmental problems that are both internal and external.

ASIAN, EUROPEAN AND PACIFIC LANGUAGES: (pg. 6 - Goal) To become acquainted with the significant characteristics of the countries or areas where the language is spoken.

BASIC PRACTICAL ARTS: (pg. 4 - Objective) To effectively meet the basic necessities of life in order to sustain life to the optimum. To develop an awareness of the needs of society for goods and services and how goods and services are effectively provided.

BUSINESS EDUCATION: (pg. V - Objective) To live effectively in today's economic environment.

HEALTH: (pg. iii & 1 - Goal) Through a developmental health education program, students will acquire accurate health information, and gain experiences contributing to attitudes, values and responsible health practices; students will be able to make decisions relating to their health and understand how these decisions affect them and the society in which they live.

HOME ECONOMICS: (pg. iii - Objective) Develop mutual understanding and appreciation of differing cultures and ways of life, and co-operate with people of other cultures who are striving to raise levels of living.

LANGUAGE ARTS: (pg. 4 - Goal) To assist students to develop the highest degree of informed control of which they are capable over their use of language.

MATHEMATICS: (pg. 13 - Goal) Develop ability to think critically and to solve problems.

SCIENCE: (pg. A-13 - Objective) Expose students to cross-cultural comparisons of critical bio-social issues, i.e., race relations, family structure, male-female roles, human resources and others.

SOCIAL STUDIES: (pg. 12 - Objective) The student values knowledge and skills enabling individuals, groups, and societies to cope effectively with the complexity of human circumstances.

Theme 11. Energy vs. Population vs. Food

Subject Area SS

Grade Level 7-12

THINGS TO DO (Grade 7)

1. Trace the population growth over the past 200 years in Hawaii. Show through the use of charts and graphs, the relationship between population growth, food consumption, and energy use. (Call or write to the State Energy Office for information.) What are some reasons why it costs more to feed an individual today than 100 years ago? Are we consuming more calories than people did in ancient Hawaii? If we grew food for personal use, would this be more energy intensive than similar food production in ancient Hawaii? Explain.

2. Ancient Hawaiians had limited resources. How did the ancient Hawaiians with limited resources manage to supply the food necessary for the people? How were the resources allocated, conserved and/or preserved? Did the ancient Hawaiians have population growth problems? Explain.

THINGS TO DO (Grade 8)

1. Debate the proposal: "The United States should increase its food production to help raise the living standards in developing countries." If this happened, how would energy consumption be affected? What are the costs/benefits of such a proposal? Should the United States help these countries develop new technology instead? Why or why not?

2. In order to avoid catastrophes associated with too large a population, assume that it has been decided that our population growth rate must be reduced by 20% in order to assure resources for future generations. Discuss in committees, the advantages and disadvantages of such a decision. What are some of the ramifications of such a decision should it be implemented?

THINGS TO DO (Grade 9)

*1. What is the relationship between energy use, population, and food? Is the relationship directly proportional? Why or why not? (See Sample Activity 11-1. "More Means Less")

2. Gather data concerning food production in various parts of the world for the past 50 years. What implications are demonstrated by the geometric increase of food production? What effects does it have on energy consumption? Which countries are the leading energy users for food production? How much energy is consumed by the U.S. food production system? (See Agriculture, Energy and Society, Interdisciplinary Student/Teacher Materials in Energy, the Environment, and the Economy (EEE), September, 1978.)

3. Role play different national leaders as they discuss the predicted food supply problems and possible solutions for their respective countries.

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*For detailed description, refer to noted Sample Activity.

THINGS TO DO (Grade 9) (Cont'd.)

4. Draw a world map indicating the population densities of various nations. Circle those areas that are considered overpopulated. Mark with a red pen those areas that are considered hunger areas. Is there a relationship between population and hunger areas? What about food production and hunger areas? Find out the energy availability and use for these various nations. Draw some conclusions about population, food supply, and energy availability and consumption.

THINGS TO DO (Grade 10)

1. Write a discussion paper on the merits of wise land use planning to ease population pressures and to encourage efficient utilization of energy resources.

2. How have energy shortages affected food production? Should the U.S. help nations affected by critical shortages of fertilizer? Does the crisis affect developing countries and industrialized nations in the same way? Why or why not? Do you feel that the OPEC countries should consider the effect of policies on newly emerging nations? Why or why not? In what ways might OPEC differentiate between the "haves" and "have nots"? Do you think their criteria are the same as ours?

THINGS TO DO (Grade 11)

1. Relate population growth and human use of energy and resources to some of today's more serious environmental problems.

2. Compare the population densities of various parts of your island to energy consumption patterns. Predict which areas are energy intensive and which are labor intensive. Find out from the State Energy Office or conduct your own energy audit of energy consumption patterns for various locations. Do you expect a tourist spot such as Waikiki or Kona to be energy intensive? Chart out findings on a map. Were the results as predicted? How might the energy intensive areas cut down on their energy consumption? Would population densities be an important consideration?

3. Would Hawaii's energy use and food production be affected if the military bases were closed? How about if tourism drops 50%? How would employment be affected? What about the economy? What might be some other effects?

217

Theme 11. Energy vs. Population vs. Food

Subject Area SS

Grade Level 7-12

THINGS TO DO (Grade 11) (Cont'd.)

4. Find out about Hawaii's immigration laws and trace their development. Is there a quota set for immigration? Was there a quota 50 years ago? What is the rate of growth per annum for Hawaii? What plans are mentioned in Hawaii's State Plan regarding the State's future growth and development?

NOTE: Suggested activities may also be used by students taking related electives in grades 11 and 12.

VOCABULARY

Energy, green revolution, haves, have-nots, industrialized nations, land use, OPEC, population density, Hawaii State Plan, under-developed countries, wants, values.

THEME 11. Energy vs. Population vs. Food

Subject Area SS (Ag, LA, M, PE, Sc)
Thematic Area EE, G, LS, VE
Grade Level 9

SAMPLE ACTIVITY 11-1. "More Means Less"

OBJECTIVE

- To understand the various energy/population/food interrelationships.

CONCEPTS

- Population changes directly influence energy demands, availability and supply.
- Population density of an area may influence the demand for and possible use patterns of energy resources.
- Population changes directly influence food consumption and supply.
- Food production requires tremendous amounts of energy and money.

ESSENTIAL COMPETENCIES

- EC 1. Read and use printed materials from daily life.
- EC 4. Communicate orally in situations common to everyday life.
- EC 7. Interpret common visual symbols.
- EC 8. Reach reasoned solutions to commonly encountered problems.
- EC 15. Demonstrate knowledge of important citizen rights and responsiblities.

RELATED ENVIRONMENTAL EDUCATION INSTRUCTIONAL GOALS AND/OR OBJECTIVES

- When faced with decisions concerning the use of earth resources, students will select practices developed in recognition of present and future environmental and human needs. (Goal: pg. D6)
- Students will demonstrate their awareness of population processes and dynamics. (Goal: pg. D23)
- Students will examine optional courses of action and their consequences for improving the quality of life and will support those that will provide optimum short- and long-term benefits for society and the environment. (Goal: pg. D38)

SOCIAL STUDIES INSTRUCTIONAL OBJECTIVES

- Define social change and explain how it has affected and influenced the lifestyle of people in various cultures. (Objective: pg. 31)
- Identify the common bonds that unify people, despite unique traditions and beliefs that distinguish different culture from others. (Objective: pg. 31)

SUGGESTED MATERIALS AND/OR RESOURCES

Colored pieces of paper, cake or other "goodies," ping pong balls, container to serve as basket.

Sample Activity 11-1

Grade Level 9

ACTIVITY (Related Core Themes: 3, 5, 9, 10, 12)

As population increases, more energy is necessary to meet the growing needs and services of the people. One type of energy of primary importance is food. Throughout the ages, people have relied on their own labor to provide for themselves. During those early years, the energy value of the food produced far exceeded the energy expended in obtaining it. However, as time progressed and as humans began to harness fossil fuel energy to do their work, energy expended in food production gradually exceeded the energy value of the food itself.

Perhaps with the present concern about our dwindling resources or perhaps with escalating prices for consumer goods, people have finally realized that "there is no such thing as a free lunch;" it takes energy to obtain energy.

This activity allows students to express their views regarding energy and population. It gives them an opportunity to develop attitudes by "experiencing" to some degree some of the problems concerning energy-food-population relationships.

1. Discuss with students the uneven distribution of energy resources throughout the world. Point out the fact that the United States uses more than 1/3 of the world's energy and has only 6% of the world's population. The following table shows population and energy use by different categories of nations for the year 1975. (Date taken from Pennsylvania Department of Education's Energy Curriculum for the Middle Grades, Harrisburgh, Pennsylvania, 1977, pg. 171.)

	% World Population	% Energy Use
Less developed countries	50	2
Developing countries	25	13
Industrialized countries	19	40
United States	6	45

2. Tell students that they are going to play a game.
3. Put slips of paper (or clips) into a container equal to the number of students in class. Each slip of paper should be one of four colors representing the four groups above. Plan it so the proportion of various slips of paper in the container is approximately equal to the population figures, e.g. half of the slips should be of the color representing the less developed countries, etc. (If you have a small group you may have to give different values to the slips of paper, i.e. blue paper may stand for 2 units and white 1 unit, etc. Ideally, however, each slip of paper should be equal in value.)
4. Have the students pull a slip of paper to determine which groups they belong to.

ACTIVITY (Cont'd.)

5. Have the students sit in groups.
6. Slice a piece of cake or divide some other "goody" into 4 sections equal to the percentage of energy consumption for the four groups.
7. Give the appropriate section of cake or "goody" to each group, e.g. the United States group should receive approximately half of the cake or "goody."
8. At this point, have each group share their goodies and ask them how they felt. What were their attitudes toward their particular portion and toward the people who had larger or smaller portions? Did they feel it was unfair?
9. Write the population and energy consumption figures for each of the four groups on the blackboard.
10. Ask them if they know which group they represented. How do they feel about the random selection of groups? Do you feel that it's by chance that they live in a developed, rich country? Discuss the relationships among population, energy production and consumption in developed and undeveloped countries.
11. Have them continue the simulation game by giving each group ping pong balls or other similar objects equal in percentage to their group's energy consumption, i.e. United States should have about half of the ping pong balls.
12. Tell them that you will be playing a game of skill and the object is to throw the ping pong ball into a designated container from a designated line. The less developed countries stand 1½ feet behind the line, the developing countries on the line and the industrialized countries and the U.S.A. 1½ feet in front of the line. Score one point for each basket.
13. Again have the students discuss their feelings and attitudes. Ask them what they think the intent of the game was. The answer may include the following:
    a. levels of current technology
    b. differences in standards of living
    c. relative wealth of developed countries
    d. "haves and have-nots"
    e. lack of opportunities and/or benefits for "have-nots"
    f. food shortages in some parts of the world
    g. others.

ACTIVITY (cont'd.)

14. Ask them the following: "If the game was modified such that every group had to get "X" number of balls into the container and each group was timed to see how long it took to accomplish this feat, would the intent of the game be the same? Why or why not? What other factors might be considered? Answers may now include:
    a. hard work necessary for undeveloped countries to supply bare subsistence for its people or to reach a certain standard of living.
    b. undeveloped countries need to put forth much labor and time to accomplish the same amount of work by a developed country.
    c. undeveloped countries are much more labor intensive and less energy intensive.
    d. others

15. Discuss with students what some of the solutions to our population-energy-food problem might be. Should the United States offer assistance? If so, what kind of assistance? Should the United Nations get actively involved? If so, how? What are some of the current programs carried on by the United Nations? What about organizations such as AID (Agency for International Development) or CARE or UNICEF? What kind of programs are they carrying out? What is our responsibility concerning the population- energy- food problem?

16. Play another simulation game involving technological advancement and possible environmental problems. Give each a tool to carry the ping pong balls from a designated area A to area B. The less developed countries should be given chopsticks, the developing countries a soup spoon, and the industrialized countries and the USA a soup ladle. Each group should have the same size container at designated area B. (A small container is preferred so that the USA and industrialized countries groups will find that their container will soon overflow.) Each group gets only one container to hold all of their ping pong balls. The groups must continually try to fill their containers until time runs out. Have them do it until they get the message of over production or too much of a good thing. As the containers get filled, students may want to modify their containers. Let them ask you and have them try to solve their own problem of "redoing" or "retooling" or "retrofitting" the container. After each simulation game, discuss how each group felt and what they feel the purpose of the activity was. Some answers may be:
    a. the difference in level of technology exists.
    b. overproduction or too much of a good thing can produce other problems such as pollution, etc.
    c. unfair advantage of "have" over "have-not" countries.
    d. there are some costs to having high level technology.
    e. others

Sample Activity 11-1

Grade Level 9

SUGGESTED FOLLOW-UP/ASSESSMENT ACTIVITIES

Make your own simulation game based on population, population density, food production, and energy consumption. For the latest statistical information, write to the Center for Science in the Public Interest (CSPI), 1757 S. Street N.W., Washington, D.C. 20009.

THEME 12. ENERGY INTERDEPENDENCE

BACKGROUND

In this theme, students will consider energy-related issues which are international in scope. For example, they will analyze different patterns of natural resources which exist around the world in terms of the geographic distribution of trade for energy resources. They will also evaluate how the demand for energy resources has promoted international trade and linked areas of the world together in an economically interdependent manner.

Due to factors of comparative advantage and gains received from trade, nations have increased their engagements in exchanging energy resources. In 1968, 33% of primary energy consumed in the world crossed foreign borders. Countries with a comparative disadvantage in the production of energy resources, however, import more energy resources than they produce. For example, about half of the oil consumed in the United States and nearly all of Hawaii's energy resources are imported at the present time. It is important that students understand the significance of sharing among nations and world interdependency. They should also be aware of the geographic, environmental, social and political factors which influence energy-related international trade.

FOUNDATION PROGRAM OBJECTIVES

FPO 1. Develop basic skills for learning and effective communication with others.
FPO 2. Develop positive self-concept.
FPO 3. Develop decision-making and problem-solving skills at the student's proficiency level.
FPO 4. Develop independence in learning.
FPO 7. Develop a continually growing philosophy such that the student is responsible to self as well as to others.

CORE THEME OBJECTIVE

To understand current energy exchange practices which link nations in an economically, socially and politically interdependent manner.

Theme 12. Energy Interdependence

CONCEPTS

1. Energy resources are unevenly distributed around the world.
2. Regional availability of particular energy resources and the growing demands for these resources foster international trade and link the world together in an economically interdependent manner.
3. The complex network of international factors influence the import/export patterns of nations and the availability and use of energy resources. These factors include: cartel, international supply and demand factors, balance of payments, patterns of trade, terms of trade, comparative advantage, political and ideological factors, exchange rates, money flows and price changes, etc.
4. Hawaii is very dependent on imported oil from foreign countries.

RELATED GOALS AND/OR GENERAL OBJECTIVES OF SUBJECT AREA GUIDES

AGRICULTURE: (pg. 58 - Unit VI) Efficient processing, marketing, and distribution are essential in making agricultural products economically available to man.

ASIAN, EUROPEAN AND PACIFIC LANGUAGES: (pg. 8 - Goal) An understanding of the interdependency of nations.

BASIC PRACTICAL ARTS: (pg. 4 - Objective) To develop an awareness of the needs of society for goods and services and how goods and services are effectively provided.

BUSINESS EDUCATION: (pg. V - Objectives) 1. To live effectively in today's economic environment. 2. To meet the ever-changing demands of the business world of work.

HOME ECONOMICS: (pg. iii - Objective) Develop mutual understanding and appreciation of differing cultures and ways of life, and co-operate with people of other cultures who are striving to raise levels of living.

INDUSTRIAL ARTS/INDUS-TECH: (pg. 2 - Objective) Develop an understanding of the nature and significance of materials, tools, processes, products, and occupations of our technological world, and their impact upon our society.

LANGUAGE ARTS: (pg. 4 - Goal) To increase student understandings of the nature and structure of the English language within the broad perspective of communication.

MATHEMATICS: (pg. 3 - Goal) Develop mathematical competence to function effectively in today's society.

MUSIC: (pg. - Objective) Demonstrate an understanding and appreciation of the music of their own culture, as well as the music of other cultures.

SCIENCE: (pg. A-13 - Objective) Expose students to cross-cultural comparisons of critical bio-social issues, i.e., race relations, family structure, male-female roles, human resources and others.

SOCIAL STUDIES: (pg. 11 - Objective) The student is able to identify and analyze problems and issues by which he or she is affected as a member of a changing multicultural society.

Subject Area SS

Grade Level 7-12

THINGS TO DO (Grade 7)

1. Find out exactly when the Hawaiian Islands became dependent on foreign oil. What factors accounted for the shift from self-sufficiency to energy dependency? What are the advantages of being energy independent? Disadvantages? What are the advantages of being energy interdependent? Disadvantages?

2. What factors today make total self-sufficiency an unfeasible goal for Hawaii? Do you feel Hawaii can become completely self-sufficient one day? Would our lifestyle be affected? Do we really want to become completely self-sufficient? Why or why not? Could we become electrically self-sufficient? Explain. What is the difference between total self-sufficiency and net self-sufficiency?

THINGS TO DO (Grade 8)

1. Take an inventory of all your play equipment and/or leisure time toys. How many toys had their origin in a foreign country? Where did they come from? If your toy or equipment is made by an American firm, does that firm also have factories on foreign soil? If your toy or equipment was made outside of U.S., can you name a substitute for it made in our country? Why or why not? For those toys and or play equipment that have no American made substitute, would you be willing to give them up? Why or why not? How does our purchase of toys serve as an example of worldwide interdependency?

2. Make a bulletin board display that shows products that would be affected by the shortage of fossil fuels. Indicate the national origin of each product.

THINGS TO DO (Grade 9)

1. Learn more about OPEC. Which countries make up OPEC? When was it formed? How are the countries that make up OPEC alike? Different? (See Sample Activity 12-1. "Dealer's Choice?")

2. What is the relationship between limited energy supply and international trade? Find out what balance of payments means. How is balance of payments related to energy interdependence? Make a chart showing the balance of payments for the United States, for Hawaii alone, and for a Middle Eastern country.

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*For detailed description, refer to noted Sample Activity.

THINGS TO DO (Grade 9) (Cont'd.)

3. Make an energy web for a transistor radio or an automobile.

4. Make a list of products found at home. Identify the country producing each item. Is the product unique to that country? If not, is the product also made in the United States? Is it a product you could do without? Are there substitutes for the product that are made in the United States?

THINGS TO DO (Grade 10)

1. Study the role of energy in the global marketplace. What are the causes and implications of energy interdependence because of the marketplace? (See Energy in the Global Marketplace, Interdisciplinary Student/Teacher Materials in Energy, the Environment, and the Economy, November, 1978.)

2. Explain the "ripple" effect. Discuss how shortages in one industry affect other industries. Cut out articles from the local newspaper that show this effect.

THINGS TO DO (Grade 11)

1. Explore and discuss the economic effects of importing foreign oil to Hawaii.

2. Research and report on the effects of governmental air quality control on the use and availability of coal, oil and natural gas. Will these pollution measures continue to make us energy dependent? How about the growing concern over nuclear plants? Is self-sufficiency feasible? Is interdependency undesirable?

NOTE: Suggested activities may also be used by students taking related electives in grades 11 and 12.

VOCABULARY

Balance of payments, comparative advantage, dependency, export, import, interdependency, net energy, OPEC, self-sufficiency, spatial distribution, total self-sufficiency, trade, ripple effect.

THEME 12. Energy Interdependence

Subject Area SS (Bus, LA)
Thematic Area EE, G, LS, VE
Grade Level 9

SAMPLE ACTIVITY 12-1. "Dealer's Choice?"

OBJECTIVE

- To understand current energy exchange practices which link nations in an economically, socially and politically interdependent manner.

CONCEPTS

- Energy resources are unevenly distributed around the world.
- Regional availability of particular energy resources and the growing demands for these resources foster international trade and link the world together in an economically interdependent manner.
- The complex network of international factors influence the import/export patterns of nations and the availability and use of energy resources. These factors include: cartel, international supply and demand factors, balance of payments, patterns of trade, terms of trade, comparative advantage, political and ideological factors, exchange rates, money flows and price changes, etc.

ESSENTIAL COMPETENCIES

- EC 1. Read and use printed materials from daily life.
- EC 3. Demonstrate writing skills commonly used in daily life.
- EC 4. Communicate orally in situations common to everyday life.
- EC 8. Reach reasoned solutions to commonly encountered problems.
- EC 9. Distinguish fact from opinion in TV and radio new broadcasts, advertising, newspaper and magazine articles, and public speeches.
- EC 10. Use resources for independent learning.
- EC 12. Identify the training, skill and background requirements of at least one occupation in which the student is interested.

RELATED ENVIRONMENTAL EDUCATION INSTRUCTIONAL GOALS AND/OR OBJECTIVES

- Students will support and practice wise utilization of traditional sources of energy and also support research and development of alternate energy sources. (Goal: pg. D2)
- Students will demonstrate an appreciation for the interdependence of living things in the closed earth system. (Goal: pg. D30)
- Students will examine optional courses of action and their consequences for improving the quality of life and will support those that will provide optimum short- and long-term benefits for society and the environment. (Goal: pg. D38)

Theme 12. Energy Interdependence

Sample Activity 12-1

Grade Level 9

SOCIAL STUDIES INSTRUCTIONAL OBJECTIVES

- Identify major economic, social and political systems that have evolved in different civilizations and cultures throughout the world. (Objective: pg. 31)
- Identify the characteristics and explain the causes of conflict among human beings and cultures and possible ways of analyzing and/or resolving them. (Objective: pg. 31)
- Identify and explain the characteristics of today's world as seen through influences from the past. (Objective: pg. 31)
- Identify the common bonds that unify people, despite unique traditions and beliefs that distinguish different cultures from others. (Objective: pg. 31)

SUGGESTED MATERIALS AND/OR RESOURCES

1. World map for students (optional).
2. Wall map of world.

Theme 12. Energy Interdependence

Sample Activity 12-1

Grade Level 9

ACTIVITY (Related Core Themes: 4, 5, 10, 13 & 15)

The world has entered an era of interdependence that is global in scale. The "energy crisis" has revealed that interdependence probably more than any other world wide event. In their efforts to deal with the energy situation, many national leaders have pledged interdependence by advocating the need for international cooperation, and supporting the idea of an international institutional framework; but in reality they have been practicing independence by making their own bilateral deals with OPEC countries.

The U. S. became dependent on imported oil during the 60's. Imports rose from 21% to 37% from 1965 to 1974. In 1976, imports averaged 7.3 million barrels per day, or approximately 42% of the total U. S. oil consumption. Oil imports jumped to 9.6 million barrels per day in February of 1977.

With the obvious risk of oil supply interruption because of the shaky political situation in the Middle East, the United States is faced with the dilemma of decreasing its oil imports and its energy consumption.

The U. S. and other countries are still dependent on the OPEC countries who are currently holding all the oil trump cards. At present, it seems to be "dealer's choice."

1. Discuss with the students what OPEC stands for. Explain to them that at present the Organization of Petroleum Exporting Countries (OPEC), accounts for over half of the world's output of oil and about 90% of all oil exported by all nations.
2. Pass out copies of a world map to each student or have them draw their own.
3. List the 13 OPEC countries on the board:
    a. Algeria
    b. Ecuador
    c. Gabon
    d. Indonesia
    e. Iran
    f. Iraq
    g. Kuwait
    h. Libya
    i. Nigeria
    j. Qator
    k. Saudi Arabia
    l. United Arab Emirates
    m. Venezuela
4. Ask students to locate these countries on their map and to make a mark to designate them as oil producing/exporting countries.
5. Next ask them to make generalizations about them. Write the students' responses on the board. Some of their answers may include:
    a. Many of the OPEC nations are near the Persian Gulf.
    b. All have access to the sea or ocean.
    c. Most OPEC countries are Islamic nations (Algeria, Indonesia, Iran, Iraq, Kuwait, Libya, Qator, Saudi Arabia, and United Arab Emirates).
    d. others

ACTIVITY (Cont'd.)

6. Assign students to small groups and have them role play the OPEC leaders. Tell them to do some research about the OPEC organization and their country in particular. Tell each group to be ready to respond to the following questions:
    a. Would you be willing to sell the U. S. all the petroleum it wants now or would you limit your sales and conserve your resources for a time when the price is much higher?
    b. Would you raise the price even if the higher prices will create hardships and possibly a recession in the consuming countries?
7. Have students role play after a week or so of research.
8. After the role playing activity, discuss the following questions with them:
    a. Why is increasing dependence on foreign oil supplies an issue of national security?
    b. Some say that the OPEC nations have done us a great favor, unintentionally. Explain.
    c. How has the current energy situation affected our international balance of payments?
    d. How has the increased demand for energy and the current shortage affected prices and wages in the U. S.? How has it affected the economy?
    e. What can and should we do to alleviate the energy crunch?

SUGGESTED FOLLOW-UP/ASSESSMENT ACTIVITIES

Describe the changes in the international political environment caused by the "geopolitics of energy." What are the implications for U. S. foreign policy?

THEME 13. ENERGY SELF-SUFFICIENCY

BACKGROUND

Theme 13 explores the movement towards complete self-sufficiency as part of the continuing search for dependable, adequate, efficient and economical sources of energy. It also considers the impacts of technology and the political, social, aesthetic, and moral attitudes and values on this movement.

Very few areas of the world are able or willing to be completely independent of other areas for the production and consumption of energy resouces. However in recent years, the Organization of Petroleum Exporting Countries (OPEC) has provided momentum for the movement toward self-sufficiency by its cartel-like behavior which resulted in cycles of oil surpluses and shortages. For example, the United States is dependent upon OPEC nations for some of its energy needs. To reduce this dependency and to strive for self-sufficiency, research on new and/or alternate energy sources is being undertaken. Conservation practices are also being encouraged.

Regardless of OPEC's actions, it is important for individuals to realize that the energy sources that we are currently using are being depleted and are for the most part non-renewable. Thus, this theme should help students understand that new patterns of energy consumption will have to evolve and that they must be prepared to cope with changes to lifestyles if self-sufficiency is to become a reality.

FOUNDATION PROGRAM OBJECTIVES

FPO 1. Develop basic skills for learning and effective communication with others.
FPO 2. Develop positive self-concept.
FPO 3. Develop decision-making and problem-solving skills at the student's proficiency level.
FPO 4. Develop independence in learning.
FPO 6. Recognize and pursue career development as an integral part of growth and development.
FPO 7. Develop a continually growing philosophy such that the student is responsible to self as well as to others.
FPO 8. Develop creative potential and aesthetic sensitivity.

CORE THEME OBJECTIVE

To understand the movement toward complete self-sufficiency as necessary and feasible.

Theme 13. Energy Self-Sufficiency

CONCEPTS

1. Self-sufficiency in terms of energy means the ability to provide energy resources in amounts necessary to meet domestic demands.
2. The problems of availability and control of energy resources make it necessary for nations to become self-sufficient.
3. Level of technology and the political, social, aesthetic and moral attitudes and values influence a nation's movement toward complete self-sufficiency.
4. Movement toward self-sufficiency will necessitate changes in life styles.
5. The State of Hawaii's plan is to reach net energy self-sufficiency by the year 2025 through research and the development of new and indigenous energy sources.

RELATED GOALS AND/OR GENERAL OBJECTIVES OF SUBJECT AREA GUIDES

AGRICULTURE: (pg. 61 - Unit IX) Continued research and experimentation are required for advancement in agricultural productivity and human's well being.

ASIAN, EUROPEAN AND PACIFIC LANGUAGES: (pg. 7 - Goal) An understanding of the geographic influences upon the economic and social development of the country.

BASIC PRACTICAL ARTS: (pg. 4 - Objective) To develop the ability to cope with change.

BUSINESS EDUCATION: (pg. V - Objective) To live effectively in today's economic environment.

HOME ECONOMICS: (pg. iii - Objective) Make and carry out intelligent decisions regarding the use of personal, family, and community resources.

INDUSTRIAL ARTS/INDUS-TECH: (pg. 2 - Objective) Apply technical knowledge and techniques for effective living in situations such as recreation, consumption, occupation, and education.

LANGUAGE ARTS: (pg. 4 - Goal) To assist students to develop the highest degree of informed control of which they are capable over their use of language.

MATHEMATICS: (pg. 13 - Goal) Develop ability to think critically and to solve problems.

SCIENCE: (pg. A-13 & 14 - Objectives) 1. Help students to analyze and synthesize holistically (using knowledge from various disciplines) in solving a problem. 2. Prepare the children for useful, effective citizenship in an increasingly complex and technological society by developing an interest in and a curiosity about the future both for themselves and for the civilization of which they are a part.

SOCIAL STUDIES: (pg. 11- Objective) The student is able to participate actively and responsibly in collective decisions affecting the social, economic, political, or physical environment in which he or she lives.

Theme 13. Energy Self-Sufficiency

Subject Area SS

Grade Level 7-12

THINGS TO DO (Grade 7)

1. It has been said that ancient Hawaiians were completely self-sufficient. Do you agree? Give examples to support your answer.

2. In what ways is the movement toward self-sufficiency a step back into "old Hawaii?" In what ways is it different? What factors are different today? Write a paper discussing the differences and similarities of self-sufficiency in ancient Hawaii and the future.

3. Make a collage showing why ancient Hawaii was considered self-sufficient; or draw a map showing how the use of natural geographic features created self-sufficient communities called ahupuaas.

THINGS TO DO (Grade 8)

1. What changes in lifestyle do you envision for you and your family as Hawaii moves toward energy self-sufficiency? Do you think that Hawaii will ever reach total energy self-sufficiency? Why or why not? How about reaching net self-sufficiency? Make a list of five (5) activities or conveniences that you may have to give up or do less of, to aid the movement toward self-sufficiency.

2. Energy self-sufficiency requires the cooperation of all. Write an essay discussing the human interactions accompanying the short- and long-range solutions to the energy crisis. Include self-interest and compare it to cooperation on individual, national, and international bases.

THINGS TO DO (Grade 9)

1. Find out if other nations besides the U.S.A. have a goal of energy self-sufficiency. Is this goal feasible and practical for all nations? Would it be easier for a highly industrialized nation or a less developed nation to reach energy self-sufficiency? Explain. Are values a factor? How about lifestyles?

2. Find out which nations or countries have the geological or geographic features suitable for developing alternate energy sources. Why is this an important factor? Are there other factors to be considered? Explain.

Theme 13. Energy Self-Sufficiency   Subject Area SS

Grade Level 7-12

THINGS TO DO (Grade 10)

1. Write a paper addressing the following statement: "Energy self-sufficiency is a political issue and hence will involve laws and regulations."

2. The movement toward energy self-sufficiency will probably require some legislation. Study and discuss the proposed legislative measures relating to energy such as rationing and progressive tax on horsepower. How are these legislative measures related to our goal of energy self-sufficiency?

THINGS TO DO (Grade 11)

*1. Investigate the economic system of various time periods in Hawaii. What is the relationship between economic system and energy use? (See Sample Activity 13-1. "Living Within One's Means")

2. Write a paper explaining features unique to Hawaii that make self-sufficiency a) necessary, b) possible but difficult, and c) cost/effective.

3. Study the State's plans for energy self-sufficiency. How is each county planning for energy self-sufficiency? Do you feel that the plans are feasible and practical? What are the costs/benefits of your island's plans?

NOTE: Suggested activities may also be used by students taking related electives in grades 11 and 12.

VOCABULARY

Allocation of resources, cartel, cost/benefit, ideology, independence, industrialized countries, lifestyle, OPEC, scarcity, self-sufficiency, spatial distribution, standard of living, Hawaii State Plan, underdeveloped countries, value.

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*For detailed description, refer to noted Sample Activity.

THEME 13. Energy Self-Sufficiency

Subject Area SS (Bus, LA, Sc)
Thematic Area EE, CE, G, VE
Grade Level 11

SAMPLE ACTIVITY 13-1. "Living Within One's Means"

OBJECTIVE

- To understand the movement toward complete self-sufficiency as necessary and feasible.

CONCEPTS

- Self-sufficiency in terms of energy means the ability to provide energy resources in amounts necessary to meet domestic demands.
- The problems of availability and control of energy resources make it necessary for nations to become self-sufficient.
- Level of technology and the political, social, aesthetic and moral attitudes and values influence a nation's movement toward complete self-sufficiency.
- Movement toward self-sufficiency will necessitate changes in life styles.
- The State of Hawaii's plan is to reach net energy self-sufficiency by the year 2025 through research and the development of new and indigenous energy sources.

ESSENTIAL COMPETENCIES

- EC 1. Read and use printed materials from daily life.
- EC 2. Complete commonly used forms.
- EC 3. Demonstrate writing skills commonly used in daily life.
- EC 4. Communicate orally in situations common to everyday life.
- EC 8. Reach reasoned solutions to commonly encountered problems.
- EC 9. Distinguish fact from opinion in TV and radio broadcasts, advertising, newspaper and magazine articles, and public speeches.
- EC 10. Use resources for independent learning.
- EC 12. Identify the training, skill and background requirements of at least one occupation in which the student is interested.
- EC 13. Demonstrate knowledge of the basic structure and functions of national, state and local governments.
- EC 14. Demonstrate knowledge of the citizen's opportunities to participate in political processes.
- EC 15. Demonstrate knowledge of important citizen rights and responsibilities.

Theme 13. Energy Self-Sufficiency

Sample Activity 13-1

Grade Level 11

RELATED ENVIRONMENTAL EDUCATION INSTRUCTIONAL GOALS AND/OR OBJECTIVES

- Students will support and practice wise utilization of traditional sources of energy and also support research and development of alternate energy sources. (Goal: pg. D2)
- When faced with decisions concerning the use of earth resources, students will select practices developed in recognition of present and future environmental and human needs. (Goal: pg. D6)
- Students will examine optional courses of action and their consequences for improving the quality of life and will support those that will provide optimum short- and long-term benefits for society and the environment. (Goal: pg. D38)

SOCIAL STUDIES INSTRUCTIONAL OBJECTIVES

- Identify and explain the development of Hawaii's economic history and its impact on the people. (Objective: pg. 47)
- Identify and explain the significant social, political and economic issues currently facing Hawaii's people. (Objective: pg. 27)

SUGGESTED MATERIALS AND/OR RESOURCES

1. Exercise 13.1.
2. Reference Book - Hawaii's Economy a Curriculum Resource Book (Draft), Department of Education, 1972.

Theme 13. Energy Self-Sufficiency

Sample Activity 13-1

Grade Level 11

ACTIVITY (Related Core Themes: 3, 14, 15)

Societies of different time periods had unique ways of choosing how to best use their natural resources. Although the reasons and problems associated with the practice of resource production and distribution may have been different, the problem was basically one of economics - a problem of scarcity.

In this activity students will have a chance to view how societies of different time periods used their natural resources. They will examine the different societies in terms of degree to which they were considered self-sufficient.

1. Briefly introduce or review the concept of the Ahupuaa. Ask students to do some research and find out more about how the ahupuaa functioned. Ask them to compare their findings with the economic systems of other time periods in Hawaii. (Have them do Exercise 13.1).
2. Discuss their findings and the questions from Exercise 13.1.
3. Discuss with the students the concept of self-sufficiency and whether Hawaii can even become completely self-sufficient. Have them do the follow-up activity to find out what has been done or will be done to reach our goal of self-sufficiency and what degree of self-sufficiency is anticipated.

SUGGESTED FOLLOW-UP/ASSESSMENT ACTIVITIES

Investigate the self-sufficiency program plans for one of the eight major Hawaiian Islands. Report findings to class.

Theme 13. Energy Self-Sufficiency Sample Activity 13-1

Exercise 13.1 Grade Level 11

Directions:
1. Investigate the economic system of various time periods in Hawaiian history: a) Ancient Hawaii - the Ahupuaa - pre 1778; b) Transitional Period - 1778-1850; c) Plantation Agriculture Period - 1850-1941; d) During and After World War II - 1941-1971; e) Modern Hawaii - 1971-present.
2. Fill in the chart below while you do your research.
3. After completing the chart, answer the questions in Part II.

PART I: From the Ahupuaa to free enterprise and Ohana.

	Ancient Hawaii	Transitional Period	Plantation Agriculture	During and After World War II	Modern Hawaii
What was (is) produced?*					
How was (is) it produced?					
For whom was (is) it produced?					
How much was (is) produced?					
What situations created the need for the decisions regarding what, how, for whom and how much to produce?					
Who had (has) the power to make decisions regarding production and distribution?					
What were (are) the decisions meant to accomplish?					
What were (are) the consequences of these decisions?					

*Production refers to goods produced locally. List only major goods and/or products.

PART II: Question for discussion

1. What was the Ahupuaa? Assume that it was possible to go back into time, write a short story (not more than four paragraphs) describing a day's activities in the Ahupuaa.
2. Explain how the ohana served as a means of distribution of goods and services. Compare the ohana with today's method of distribution.
3. How do activities in the days of Ahupuaa compare with daily activities in our society of today?
4. According to your chart, who decided (decides) how natural resources should be used in each time period? Did the decisions consider the use of resources as efficiently and wisely as possible? Why or why not? Give evidence(s) for your answer.
5. According to the chart, was Hawaii ever completely self-sufficient? Cite evidence (data) to support your answer. Did the island's geographic features and/or location account for its degree of self-sufficiency?
6. Describe kinds and/or types of occupations and/or jobs available during the different time periods.
7. Give evidence to show that we have moved from a society that was highly labor intensive and oriented to needs satisfaction to one that is highly energy intensive that is oriented to wants situation.
8. If you could choose a time period in which to live, which time period would you choose? Why? Write a brief paragraph explaining your reasons. Also, explain some of the changes that might occur, or that may have to occur.

THEME 14. APPROPRIATE ENERGY TECHNOLOGY

BACKGROUND

Theme 14 focuses on appropriate energy technology as a fundamentally different approach to meeting the social and economic needs of human beings. Appropriate technology includes tools, techniques, processes, and ways of thinking and acting which maintain or improve our quality of life. It is a trend away from energy-intensive or hard technology and a movement toward labor-intensive or soft technology to insure an energy future which is affordable, sustainable, and ecologically sound.

The cheap-energy or hard technology based on fossil fuels has contributed to many of our environmental, economic, and social problems. Long-term solutions to these problems are being sought as part of the planning being done for a future based on additional and different sources of energy. Thus, technology that is more appropriate than that which now is used by our society is needed for this transition from fossil fuels to alternate energy sources. Examples of appropriate technology include solar energy systems, wind energy systems, solid waste recycling systems, composting, organic gardening and farming, development of bicycle and low-speed mass transportation networks, use of climate-based design in home construction, "cottage" or home-based industries, etc. Such technology will necessitate major changes in personal lifestyles and social goals.

This theme should help students understand the need for alternative goals and directions that value human activity, preserve the natural environment, and involve appropriate energy technology. Attainment of these goals should maintain or improve the quality of life for all.

FOUNDATION PROGRAM OBJECTIVES

FPO 1. Develop basic skills for learning and effective communication with others.
FPO 2. Develop positive self-concept.
FPO 3. Develop decision-making and problem-solving skills at the student's proficiency level.
FPO 4. Develop independence in learning.
FPO 6. Recognize and pursue career development as an integral part of growth and development.
FPO 7. Develop a continually growing philosophy such that the student is responsible to self as well as to others.
FPO 8. Develop creative potential and aesthetic sensitivity.

CORE THEME OBJECTIVE

To understand that energy technology has to fit the use to which it is put with minimum negative effects upon the quality of life.

Theme 14. Appropriate Energy Technology

CONCEPTS

1. Appropriate energy technology is simple and efficient, makes best use of available renewable energy resources, conserves non-renewable resources, depends largely upon human labor, emphasizes the use of local materials and skills, is small-scale, decentralized, self-sustaining, and non-polluting.
2. The political, social, aesthetic and moral attitudes and values of a society influence and are influenced by the development and use of appropriate energy technology.
3. The development and use of appropriate energy technology will require major changes in personal lifestyles and social goals.
4. As one of the first selected pilot sites in the nation, Hawaii has undertaken a wide variety of projects involving appropriate energy technology.

Theme 14. Appropriate Energy Technology

RELATED GOALS AND/OR GENERAL OBJECTIVES OF SUBJECT AREA GUIDES

AGRICULTURE: (pg. 61 - Unit IX) Continued research and experimentation are required for advancement in agricultural productivity and human's well being.

ART: (pg. 7 - Objective) Use the potentialities of art and take action to shape and enhance the quality of one's personal and public environment.

ASIAN, EUROPEAN AND PACIFIC LANGUAGES: (pg. 7 - Goal) An understanding of how governments are similar to and different from our own in solving their problems.

BASIC PRACTICAL ARTS: (pg. 4 - Objective) To effectively utilize the resources of our technological world and to understand the importance of conservation.

BUSINESS EDUCATION: (pg. V - Objective) To live effectively in today's economic environment.

HOME ECONOMICS: (pg. iii - Objective) Perform the tasks of maintaining a home in such a way that they will contribute effectively to furthering individual and family goals.

INDUSTRIAL ARTS/INDUS-TECH: (pg. 2 - Objective) Apply technical knowledge and techniques for effective living in situations such as recreation, consumption, occupation and education.

LANGUAGE ARTS: (pg. 4 - Goal) To assist students to develop the highest degree of informed control of which they are capable over their use of language.

MATHEMATICS: (pg. 13 - Goal) Develop an understanding of the importance and relevance of mathematics historically and in the world today.

SCIENCE: (pg. A-14 - Objectives) 1. Encourage students to maintain a safe and healthy environment. 2. Help students gain experience with the potentialities and limitations of the methods of scientific and social investigation but at the same time recognize that the environment can be interpreted and manipulated.

SOCIAL STUDIES: (pg. 11 - Objectives) 1. The student is able to construct, evaluate, and revise alternatives for personal goals, plans, or problem solutions, considering costs and benefits to self and to others affected by his or her decisions. 2. The student is able to participate actively and responsibly in collective decisions affecting the social, economic, political, or physical environment in which he or she lives.

Theme 14. Appropriate Energy Technology

Subject Area SS

Grade Level 7-12

THINGS TO DO (Grade 7)

1. Show your understanding of appropriate technology by citing examples of "appropriate technological" practices by the ancient Hawaiians.
2. Tour your community and make a list of the appropriate and inappropriate technology cited.
3. Research and find out more about the appropriate technological projects being carried out in Hawaii. Visit one or two sites if possible.

THINGS TO DO (Grade 8)

1. Find out what appropriate technology is. Do you consider the harnessing of wind energy appropriate technology? Why or why not? Is it possible for an energy source such as solar energy to be used inappropriately and appropriately?
2. Research and report on current developments and explorations for new energy sources and the methods proposed for harnessing these new sources. How many are considered technologically appropriate? Why?

THINGS TO DO (Grade 9)

1. Define appropriate technology. Find articles that illustrate projects that fit the definition for appropriate technology. Is it possible that a project considered appropriate may be inappropriate for another time and place? Explain.
2. Make a list of appropriate technological practices in ancient civilizations. If possible demonstrate or show pictures of these practices and/or measures.

THINGS TO DO (Grade 10)

1. As a class, write a proposal for appropriate technology monies. For example, the proposal may involve the construction of a solar water heater for the cafeteria. Follow the criteria set by the Department of Energy. Submit your proposal to the Department of Planning and Economic Development (DPED), State Energy Office.
2. Define appropriate energy technology. Could an inappropriate project in the community be made appropriate? Choose a community project that you consider to be an example of inappropriate technology and propose changes that could be made to make it appropriate.

Theme 14. Appropriate Energy Technology

Subject Area SS

Grade Level 7-12

THINGS TO DO (Grade 11)

1. Invite a speaker from HNEI (Hawaii Natural Energy Institute) to report on some of the appropriate energy technology projects carried out in Hawaii today. Visit a site if possible.

2. Write a paper evaluating the statement: "Bigger is not necessarily better; slower can be faster; and less can be more."

NOTE: Suggested activities can also be used by students taking related electives in grades 11 and 12.

VOCABULARY

Aesthetics, appropriate technology, conservation, continuity, cost/benefits, ecologically balanced, hard technology, inappropriate technology, land use, obsolescence, non-polluting, passive technology, soft technology.

THEME 15. FUTURE PERSPECTIVE

BACKGROUND

In theme 15, students consider the various ways in which they can participate in creating an energy secure future. An understanding of all facets of today's energy-related problems and issues and consideration of the range of consequences of today's decisions and actions will help students to envision these possible futures.

The students explore their values and make their own decisions when confronted with difficult but necessary choices in formulating plans and actions to achieve a preferred future. This kind of decision-making involves an objective and rational assessment of the future outcomes of alternative actions and policies regarding energy use and the environment. These decisions and actions are based on the values of society, and understanding of basic science and natural science concepts, technological development, economic factors and environmental and ecological considerations.

Development and examination of alternatives and all possible outcomes of many possible futures will help students realize the importance of being flexible and adaptable. This will enable them to better cope with rapidly changing technology and political, social and economic circumstances affecting energy use and the environment.

The students should understand that as individual citizens, they need to have an active say in and be in control of their futures planning. They should also understand that decisions made today will affect both their own lives and those of generations to come.

FOUNDATION PROGRAM OBJECTIVES

FPO 1. Develop basic skills for learning and effective communication with others.
FPO 2. Develop positive self-concept.
FPO 3. Develop decision-making and problem-solving skills at the student's proficiency level.
FPO 4. Develop independence in learning.
FPO 5. Develop physical, social and emotional health.
FPO 6. Recognize and pursue career development as an integral part of growth and development.
FPO 7. Develop a continually growing philosophy such that the student is responsible to self as well as to others.
FPO 8. Develop creative potential and aesthetic sensitivity.

CORE THEME OBJECTIVE

To utilize decision-making and problem-solving skills in formulating plans and actions to achieve a preferred future in energy use and the environment.

Theme 15. Future Perspective

CONCEPTS

1. Energy availability and changes in the attitudes of individuals and societies regarding energy use will affect our future lifestyles.
2. Economic, social, political, and technological decisions made now will affect the availability, distribution and use of energy in the future.
3. The State of Hawaii is in the process of developing a functional plan for a preferred future regarding energy use and the environment.

Theme 15. Future Perspective

RELATED GOALS AND/OR GENERAL OBJECTIVES OF SUBJECT AREA GUIDES

AGRICULTURE: (pg. 57 - Unit V) In order to reach desired goals, man must be able to employ effective management practices.

ART: (pg. 7 - Objective) Use potentialities of art and take action to shape and enhance the quality of one's personal and public environment.

ASIAN, EUROPEAN AND PACIFIC LANGUAGES: (pg. 7 - Goal) An understanding of how governments are similar to and different from our own in solving their problems.

BASIC PRACTICAL ARTS: (pg. 4 - Objective) To understand the elements of management and effective management practices as they relate to our technological society.

BUSINESS EDUCATION: (pg. V - Objectives) 1. To live effectively in today's economic environment. 2. To meet the ever-changing demands of the business world of work.

HOME ECONOMICS: (pg. iii - Objective) Establish long-range goals for financial security and work toward their environment.

INDUSTRIAL ARTS/INDUS-TECH: (pg. 2 - Objective) Apply technical knowledge and techniques for effective living in situations such as recreation, consumption, occupation, and education.

LANGUAGE ARTS: (pg. 4 - Goal) To increase student understanding of the nature and structure of the English language within the broad perspective of communication.

MATHEMATICS: (pg. 13 - Goal) Develop ability to think critically and to solve problems.

PHYSICAL EDUCATION: (pg. 106 - Objective) Acquire the habit of participating in wholesome recreational activities.

SCIENCE: (pg. A-13 & 14 - Objectives) 1. Help students to analyze and synthesize holistically (using knowledge from various disciplines) in solving a problem. 2. Prepare the children for useful, effective citizenship in an increasingly complex and technological society by developing an interest in and a curiosity about the future both for themselves and for the civilization of which they are a part. 3. Facilitate a positive self-concept through the development of self-pride and a sense of accomplishment by encouraging self-expression of conventional and unusual ideas as well as independence in learning.

SOCIAL STUDIES: (pg. 11 - Objective) The student is able to select and use appropriate criteria, procedures, and information sources to assess the validity or significance of findings about past, present, or future human life or affairs.

Subject Area SS

Grade Level 7-12

THINGS TO DO (Grade 7)

1. Write and perform a skit illustrating what life in Hawaii would be like 50 years from now. Will we be energy self-sufficient? What kinds of clothing will we wear? What modes of transportation will we use? Etc.

2. Build a time diorama of energy use titled: "Then, Now, Tomorrow." Your project could illustrate Hawaii's past, present and future in one or more of the following areas: a) transportation modes; b) food consumption; c) lighting; d) heating and cooling; e) arts and crafts; f) housing; g) recreation; h) others.

THINGS TO DO (Grade 8)

1. Make a collage showing what your future life may be like. What kind of job will you have? Will future jobs and skills differ from today's?

2. Simulate a Senate subcommittee investigating the possibilities of outlawing night baseball, Indianapolis 500, domed stadiums, late night television, and other energy consuming recreation. Describe what life might be like if it became a reality.

THINGS TO DO (Grade 9)

1. Discuss several possible future alternatives for the world. Have a panel discussion on one alternative and its consequences.

2. Write a science fiction story about life on earth in the year 2020 A.D. Describe future lifestyles, energy use, energy production, etc.

3. Describe the characteristics of alternate world citizenry models. What are the advantages and disadvantages of world citizenship? Write a profile of a world citizen.

THINGS TO DO (Grade 10)

1. Correlate the problem of growth rates in population with growth rates in energy use and hypothesize the trade-offs necessary to ensure an acceptable quality of life for future generations.

2. Research the laws, ordinances, policies, etc., related to energy use and/or pollution. Based on your findings, will these laws, ordinances, policies, etc., continue to exist 20 years from now? Why or why not? What would be some possible new laws 10 years from now? What evidence or reasons can you give to support your answer?

Theme 15. Future Perspective

Subject Area SS

Grade Level 7-12

THINGS TO DO (Grade 11)

1. Identify some energy problems that could be critical by the year 2000 if current energy use practices are not changed. In your opinion, what changes are necessary?

2. Write serveral alternatives for the future and present them to various people. Find out what option seems to be most popular. Why? Share your findings with fellow classmates.

NOTE: Suggested activities may also be used by students taking related electives in grades 11 and 12.

VOCABULARY

Allocation of resources, alternate energy, alternative futures, choice, command system, decision making, lifestyles, long-range planning, planning, quality of life, scenarios, standard of living.

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